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ABSTRACT

This document begins with a brief report describing how the Center for Occupational Research and Development (CORD) organized a coalition of organizations related to the hazardous materials industry to identify required skills and training for Hazardous Materials Management Technician (HMMT). CORD staff established a committee of employers, representatives from labor organizations and associations, vocational educators, and others to write the skill standard. The committee identified required competencies for technicians in the industry; determined knowledge, tools, and training necessary for certification; compared certified to noncertified employers; established instructional qualifications; and developed a method for assessing and updating the skill standard as technology changes. During phase 2, the standard was validated and disseminated, certification requirements were determined, and an implementation guide was developed. The 14-page report is followed by the following: skills and validation surveys and responses; meeting information; lists of advisory committee members and business/industry and education representatives; marketing and publicity materials; newsletters; articles; database of those to whom the standard was disseminated; sample presentations made at site visits, conferences, and meetings; correspondence; educational survey and final report; business/industry questionnaire; workshop materials; project facts and general information; remediation; revisions; and information on other related projects. (YLB)

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ED 461 007

Hazardous Materials Management Skill Standard
Final Project Report

Center for Occupational Research and Development

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Hazardous Materials Management Skill Standard
Final Project Report

Center for Occupational Research and Development

Project Purpose

In 1992, the Center for Occupational Research and Development (CORD) proposed to organize and manage a coalition of organizations related to the hazardous materials industry that would identify skills necessary and the training required for Hazardous Materials Management Technicians (HMMT). In identifying the skills necessary, CORD staff established and managed a coalition of employers, representatives from labor organizations and associations, vocational educators, and others affiliated with hazardous materials management. Representatives from these organizations assembled as a committee to accomplish the following objectives while writing the skill standard under the document development phase of *The National Skills Standard for Hazardous Materials Management Technicians* project:

- identify required competencies for technicians in the industry;
- determine knowledge, tools, and training necessary for certification;
- compare certified to noncertified employees;
- establish instructional qualifications; and
- develop a method for assessing and updating the skill standard as technology changes.

This final report provides detailed information regarding the steps CORD's staff, industry and educational representatives, consultants, and third-party evaluators took during phase one in the development and writing of *The National Skills Standard for Hazardous Materials Management Technicians* document and during the validation and verification phase while completing follow-up activities.

Development of National Skill Standard

The professional staff at CORD coordinated the development of a skill standard for technicians who handle hazardous materials and waste. Project director James Johnson assembled a team of independent consultants to provide the CORD staff with technical and evaluatory assistance throughout the program and to serve as integral members of the project team. To achieve project activities, the CORD staff, consultants, and a national advisory committee were assembled to guide the project.

Hazardous Materials Management Technology
Skill Standard Project

National Advisory Committee Membership

Industry	13
Consultant/Remediation	7
Municipal	2
Unions	3
Societies	6
Government	2
Military	3
Colleges (Two- and Four-Year)	13

Table 1

The advisory committee represented both large and small companies and businesses, as well as government, labor, professional societies, and education. Selected members of the advisory committee served on two subcommittees: one of them responsible for evaluating the certification requirements for HMMT; the other, for developing occupational titles. The general advisory committee's role was to provide advice and guidance for the project, and aid in the development of job-level descriptions of the skills and behaviors needed by HMMT employees. The committee, including representatives of various regulatory agencies, provided different viewpoints. The composition of the HMMT advisory committee is shown in Table 1.

HMMT Skill Standard Background

The stated goal of the project, as given in the proposal document, is to "organize and manage a coalition of organizations related to the hazardous materials industry, which will identify the skills necessary and the training required for hazardous materials management technicians (HMMT)." According to the proposal and to achieve this goal, the following activities were to be accomplished:

1. research businesses and industries involved in hazardous materials management
2. form a coalition of participants in the project
3. select and empower a technical committee including business, education, and labor leaders
4. design, through a participative, iterative process, a model for a skill standard in the industry
5. devise a method for assessing and evaluating the model
6. promote a process for maintaining and updating skill standard
7. secure an independent third-party evaluator to conduct a summative evaluation of the project

In achieving the first two activities, CORD project team members interviewed more than 150 technicians, employers, consultants, and educators who are actively involved with hazmat. The staff also conducted site visits to various locations (see Appendix.). Dr. Jerry Riehl and Mr. Robert Bear, P.E., were chosen as consultants who selected appropriate businesses and industries that should be represented in the advisory committee.

To accomplish activities three and four, the technical advisory committee met to discuss a list of possible job titles and tasks. The committee arbitrarily categorized HMMTs into four occupational groups according to the area in which the worker is employed. These categories include the following:

- **Remediation:** This area involves cleaning up contaminated outdoor sites such as Superfund sites or leaky, underground petroleum tanks at gas stations and nuclear facilities.
- **Transport, treatment, storage, and disposal (TTSD):** This includes the work done within companies like oil refineries, chemical process industries, municipal waste treatment facilities, even local manufacturers, and disposal locations such as incinerators.
- **Regulations:** This includes technicians who specialize in applying regulations set by EPA, OSHA, and state regulatory groups.
- **Laboratory/Analytical:** This includes those who work in laboratory facilities. Their principal job tasks relate to collecting, testing, and analyzing contaminated soil, air, and liquid samples.

The committee, going on previous experience, estimated that 80 percent to 90 percent of tasks, skills, and knowledge would be identical for all four groups.

The committee directed that a skill standard for HMMTs must include all the topics identified by OSHA training requirements (i.e., a person employed as an HMM technician must be certifiable according to OSHA requirements). Also, regional variations affecting the skills expected of an HMM technician must be considered. (i.e., an HMM technician employed in Florida might need to know skills for employment at a petroleum company. Whereas someone employed at a nuclear cleanup site will need different skills).

To accomplish activity five, third-party evaluators were included in the project planning process and maintained ongoing communication with the project director. Third-party evaluators were responsible for writing three evaluation reports: two formative and one summative. The two formative reports were to be used for midcourse adjustments. In addition to the formative reports, updates to those in the industry were provided in the way of a newsletter, *Skill Standard Report.* Three issues, Volume 1, Numbers 1 and 2, and Volume 2 Number 1, were produced and mailed to nearly 1,000 representatives of industry and education (see Appendix).

To determine appropriate ways to accomplish activity six, a certification subcommittee was formed and met in July 1994. They outlined steps that would help to maintain and update the standard over time. Subcommittee recommendations included:

- Training programs should be accredited by an organization consisting of educational providers. These may include conventional public schools, private schools, and consulting agencies.
- A certification program for individuals graduating from accredited programs also should be implemented. Certification programs may be operated by different agencies, but professional societies would be a typical choice.

- Specialty certifications also should be made available for subsets of the hazardous materials management industry.
- The skill standard must be the basis for any certification program. Assessment of individual's skills can be accomplished by a comprehensive test but must also contain some performance-based items.
- Certification should be directed toward "job-entry" skills. A degree should not be a requirement for certification.
- Periodic recertification and assessment should be built into the program.
- A continuing education requirement should be incorporated in the recertification process.

Additional steps taken to achieve activity number six include the development of a database with information from schools with HMM programs. The database included: school information–contact name, address, phone; program information–type, length, degree or certificate; course information–course title, length, and so on; and textbook information–description of book used for each course in the program. To date, data from approximately twenty schools have been entered. This activity was terminated when Partnership for Environmental Technology Education (PETE) received funding from the National Science Foundation, which was part of their plan.

Implemented as part of activity six, professional societies related to the control of hazardous materials or environmental issues participated in the project. They include: National Environmental Health Association (NEHA), National Environmental Training Association (NETA), National Association of Environmental Professionals (NAEP), Hazardous Materials Control Resources Institute (HMCRI), the Partnership for Environmental Technology Education (PETE), the Institute for Hazardous Materials Managers (IHMM) and the Academy of Hazardous Materials Managers (AHMM).

The primary purpose of activity seven was to secure an evaluator. Dr. Jerry Riehl worked on the project until June 1994. Riehl constructed the first formative report, and because of health-related problems, Ms. Jean Drevdahl replaced him as project evaluator. Drevdahl completed the second formative evaluation and a summative report.

Project Process

To expand the task list, the subcommittee suggested a survey of practitioners. In response, several committee members and others provided job descriptions for employment categories grouped under the broad title of HMMT. An activity journal to record job functions for which they were responsible during a typical day, as well as weekly, monthly, and annual tasks was distributed to more than 100 employed technicians. Fifty responses were returned. The activities listed in the journals and task statements from job descriptions were used to draw up a lengthy outline. The task statements in the outline were grouped and a critical verb was associated with each statement. This outline became the main discussion topic at three regional focus group meetings where participants were asked to verify or change the verb given in each statement and to rate each statement according to three levels of priority.

A draft survey instrument was pilot-tested at the April 1994 focus group meeting in New Orleans. A modified Delphi technique was used for this exercise. Participants joined groups corresponding to the four major areas of HMMT. Each group reviewed the survey and deleted tasks not performed in that specialty area. If the verbs describing the task were inappropriate, other verbs were selected.[1]

After the activities were verified for accuracy, they were classified according to importance. All information was later formatted into a questionnaire, a draft of which was reviewed and modified. A revised draft survey was mailed to all individuals attending the July 17, 1994 meeting in Waco, Texas. Committee members sent a copy of the draft to a small group of individuals in their geographical areas to review, comment, and suggest changes to the survey to check its completeness prior to general dissemination. The information obtained from this step was returned to NEHA[2] on August 1, 1994. NEHA incorporated these changes into the final survey, which was mailed out August 14, 1994 (see Appendix).

A second subcommittee meeting was held in Hagerstown, Maryland, at which time a second draft of the survey was used to ensure the accuracy of the HMMT skills. Then, changes were integrated into the survey to be used at a regional meeting in Fort Worth, Texas. At this meeting, the advisory committee—grouped for discussion according to the four occupational groups identified earlier (remediation, TTSD, regulations, laboratory)—studied modified versions of the task/activity outline and made further changes.

The recommendations resulting from the Fort Worth (held June 1994) advisory committee meeting included the conversion of the task/activity outline into a survey—NEHA subcontracted to design, distribute, collect, and accumulate data from this survey—to be distributed to large numbers of employers for validation. All skill standard advisory committee members and members of NEHA, NAEP, HMCRI, and NETA received copies of the skill standard survey. Each of these societies cooperated in mailing the survey to their membership. In addition, students from PETE schools in three regions of the country conducted phone interviews with potential HMMT employers to determine their specific needs. The goal, to obtain 200 completed surveys, and 240, or 20.9 percent of the mailed surveys, was obtained. The survey review team met to analyze the returned information.

An additional subcommittee was formed to consider the certification and assessment of individuals against the standard. This committee was formed and met in August 1994, at which time they made several recommendations:

1. HMMT training programs measured against the skill standard should be accredited by an organization consisting of educational providers. The requirements would include items like teacher qualifications, facilities, lab-to-lecture ratio, hours of instruction, and so on.
2. A certification program for those graduating from accredited programs should be implemented. These programs should be operated by different agencies such as professional societies. A comprehensive certification for a "general" HMMT should be maintained by a technician-oriented organization.

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[1] Explain the process.

[2] NEHA was subcontracted by CORD for this part of the project.

3. Specialty certifications should be made available for subsets of the hazardous materials management industry; for instance, in nuclear technology.
4. The skill standard should be the basis for any certification program. Individual skills should be assessed by a comprehensive test, but should also contain some performance-based skills, which could be assessed while a student is enrolled in an accredited program.

The advisory committee agreed that certification should be directed toward "job-entry" skills; a degree should not be a requirement for certification (group opinion). Periodic recertification and assessment should be built into the program. A continuing education requirement should be incorporated in the recertification process.

A project team meeting was planned for September 1994 at the NEHA offices in Denver, Colorado, to evaluate the data returned from the survey and to condense the information into one of the formats suggested by the Department of Education. Although this evaluation process took a considerable amount of time and effort, it provided an excellent way of secure the accuracy and completeness of the questionnaire.

In October 1994, the HMMT skill standard was disseminated during a workshop in Waco, Texas, to representatives of twenty-five colleges. Approximately half of attendees had hazmat programs but wanted to ensure their curriculum contained job tasks listed in the skill standard. The other colleges were interested in starting hazmat programs and wanted their curricula to meet the skill standard. The workshop was intended to help educators design strategies to integrate the standard in their program development. Industrial experts involved in the design of the standard made presentations and worked with the educators to formulate methods of measuring existing HMMT programs against the standard and of establishing new HMMT programs.

Workshop participants toured three different industries located in Waco that employ HMMTs: Allergan, Marathon Power Technologies, and Plantation Foods. Afterward, participants compared occupational similarities and differences. Workshop participants were able to validate the skills and tasks listed in the skill standard by observing the HMMTs at each of the worksites and comparing job functions to the standard.

Validation and Verification

A first draft of the hazardous materials management technician skill standard was completed by October 1994. After the standard was published in 1994, additional work was needed in others areas. CORD's staff developed goals for four areas concerning the standard: validation, dissemination, certification, curriculum design and development issues. Additional funding and time were requested and granted to complete these goals under phase two.

Validation

- **Goal 1: Validate and refine the standard determined in phase one**

During phase two of the project, the first goal was to validate and refine the content of the HMMT skill standard by surveying industries that employ HMMTs.

To complete this process, two surveys were developed and distributed (see Appendix). One went to PETE schools to determine if they were teaching the job functions listed in the skill standard. A second survey, developed by Robert Bear, P.E., Chair of the HMMT skill standard advisory committee, went to the industrial population employing HMMTs: The survey included thirteen job functions listed in the skill standard and asked respondents to evaluate the frequency of each job function.

NETA sent approximately 5,000 industrial surveys to environmental managers listed in a Linton database. Five hundred surveys were sent to the membership of NAEP. A total of 373 surveys were completed and received by the April 30, 1995 deadline. Bear and Gayle Bowles-Haecker, CORD, analysed the data, and conclusions were presented at a meeting in Orlando, Florida, in January 1996.

These conclusions were also presented in an unpublished article written by Bear The article, "*Soft Skills*"—*What Employers Are Looking for in Employees*, highlights the skills identified by industry as the most important skills an HMMT should possess upon entering the workforce. The responses reaffirmed that skills associated with environmental technology were necessary, but, surprisingly, skills like communication, computer knowledge, team- work, and writing—functions known as "soft" skills—ranked high. Figure 1 shows how manufacturing, service, and public business/industry (labeled All) ranked on a scale of 0 to 5 the importance of skills represented while carrying out environmental technician occupational responsibilities. Those surveyed were asked to respond to thirteen job functions industry representatives indicated they want entry-level hazardous materials technicians to perform (identified by numbers on chart). These skills have been identified in the skill standards.

In addition to helping business, the standard is helping educators transition from paper and pencil testing methods into more hands-on methods by listing specific competencies and skills that should be mastered upon completion of a program. This form of assessment allows educators to see that students can apply concepts to real-world situations. Some of the methods being used include keeping a portfolio, working in teams, working on semester-long projects, and so on. The assessment process includes mastery of elements from both the SCANS and skill standard mastered prior to certification, compliance, or degree.

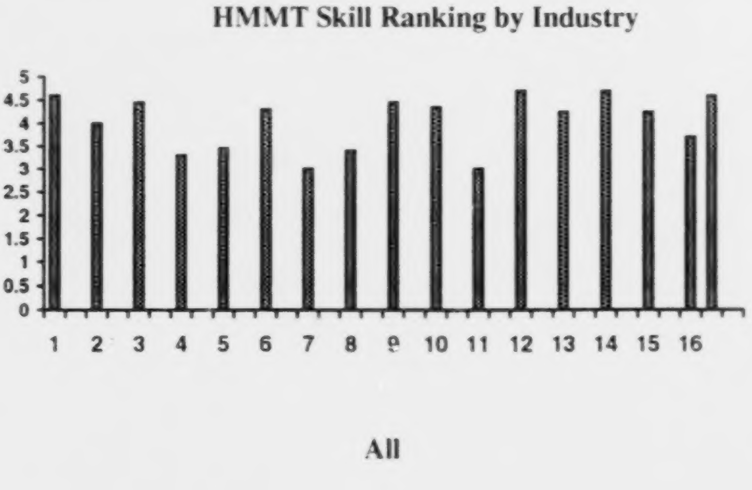

Figure 1

1. Select and use appropriate PPE and respiratory equipment
2. Collect, prepare, document, and ship samples for analysis
3. Transport and store hazardous materials and waste
4. Operate treatment and disposal systems
5. Mathematics background
6. Science background
7. Physics background
8. Computer applications background
9. Comprehension of written materials
10. Communicate thoughts, ideas, information
11. Apply statistical quality-control techniques to situations
12. Work and communicate as a team member
13. Evaluate sample data
14. Safely handle hazardous materials and waste
15. Respond to emergency situations
16. Operate equipment
17. Identify and label hazardous materials and waste

Partial completion of the academic survey was headed by Jean Drevdahl. The purpose of the survey was to determine if the schools with HMMT programs covered the fourteen job functions and supporting job tasks in the skill standard. Each respondent rated these items on a Likert scale with a one (1) representing "the student would have a basic knowledge of this task" to a five (5) representing "the student has mastered this particular skill." Two hundred forty surveys were mailed to seventy-eight PETE schools with any components of an HMMT program; fourteen schools responded. (See Appendix for summative report.)

Dissemination

- **Goal 2: Disseminate a draft of the standard to educators and professionals in the field of HMMT.**

The second goal of phase two was to disseminate the standard to educators and professionals in the HMM field and request feedback on the contents. Three dissemination meetings were held: Waco, Texas, October 3-4, 1994; Gainesville, Florida, April 27-28, 1995; and Washington, D.C., June 14, 1995. Advisory committee members attending these meetings obtained presentation materials developed by team members who covered the progress of the HMMT skill standard grant. These materials were presented at seminars and conferences, which was an effective way to increase participation of committee members, distribute information, and minimize expense. Team members made these presentations at the following meetings:

1995	Location	Organization
Jan 20-21	Raleigh, NC	SE PETE
Jan 26-27	Charleston, SC	EPA Seminars

Mar 3-4	Washington, DC	Critical Issues
Mar 20-21	Cedar Rapids, IA	NC PETE
Apr. 3-5	Austin, TX	P^2 Roundtable
May 4-5	Portland, OR	NW PETE
May 22-23	Berkley, WV	DOE/IUOE
Jun. 19	Cedar Rapids, IA	Fellows Meeting
Jul. 14	Orlando, FL	Southern Regional Education Board

To increase the distribution of the skill standard, 2,007 copies were mailed to companies, individuals in university departments of education, trade and professional organizations, publications, and deans of two- and four-year colleges. The document was distributed geographically to cities where PETE has offices: Northwest PETE received 485 copies, North Central PETE received 282 copies, Northeast PETE received 325 copies, Western PETE received 59 copies, South Central PETE received 377 copies, and Southeast PETE received 152 copies.

To get feedback on the standard and to maintain and update the contents, presentations were made at various community college meetings—two PETE meetings and two semiannual National Coalition of Advanced Technology Centers (NCATC) meetings. Jim Johnson, project director, presented the HMMT skill standard at the semiannual National Tech Prep Network (NTPN) meeting in Baltimore, Maryland. With assistance from project consultant Robert L. Bear, P.E., Johnson presented the skill standard document at the annual NTPN meeting in Minneapolis, St. Paul, Minnesota. Both of these presentations allowed secondary and postsecondary schools to learn about the skill standard and emphasized the importance of a solid science foundation for students who are interested in hazmat as a career, as noted in the standard. Approximately 200 individuals attended these presentations.

In addition to presentations and conference exhibits, two articles were written, submitted, and published (see Appendix). They include: "The Development of a Skill Standard for Hazardous Materials Management Technology Technicians" by Jim Johnson and Robert Bear, P.E., published in the January/February 1995 edition of the *Journal of Environmental Health*, and "Connecting Industry With Education: Skill Standard for Hazardous Materials Management Technicians" by Gayle Haecker, published in the summer 1995 edition of *ATEEC News*.

Certification

- **Goal 3: Determine certification requirements for HMMTs to be employable in their industry.**

A certification subcommittee was formed and met during phase one to plan for work to be completed during phase two. The questions as to whether the field needs program accreditation, certification of instructors, or certification of students are still unanswered. A survey to representatives working in the environmental health and safety field identified over fifty-seven certifications, but questions remain as to the advantages and value of so many programs. Discussing the issues of environmental technician accreditation and certification was key to phase two of the HMMT skill standard project. Members of the PETE Board of Directors stepped forward to recommend to member schools and organizations the implementation of the skills standard, which has led to a national accrediting program for associate degree programs based on the skill standard.

Further Work

In terms of certification, a program for trained technicians is needed. phase two solicited several professional societies offering certification programs to incorporate the skills standard into their technical certification programs. In the first steps of implementing the standard into these programs, the CORD staff developed a taskforce to determine the requirements for individual certification and program accreditation. Rick Richardson, NETA; Reggie Moore, NEPA; and Doug Feil, Kirkwood Community College representing PETE, established a plan to complete this goal.

The taskforce met July 28, 1995 in Reno, Nevada, to develop criteria for certification of HMMTs and accreditation of academic training programs. They defined certification as the recognition of demonstrated competency of an individual. Accreditation was defined as the recognition of a program that meets standards and criteria established by a peer group. Additionally, some of the key elements of a successful certification program were listed to include:

1. Buy-in from the customers (employers and trade and professional organizations),
2. Certification must be voluntary,
3. Certification will include an ongoing evaluation and assessment of the program elements,
4. The certification program will be validated by peer review,
5. Certification will be composed of a written and a practical component, and
6. The program will be exportable and duplicated with appropriate modifications for ????

At this meeting a tentative model for the certification and accreditation programs was discussed. An update of their progress was presented at regional PETE meetings in fall 1995. At the close of the project, certification continues to be an issue. Too few industrial representatives have caught on to the need for certification. At a meeting in Denver, Colorado, in early 1996, NEHA representatives showed their technician certification exam, which was based on the skill standard. At that time, they expressed the most important criterion for certification: two years of occupational experience. This requirement would be changed if the student had completed a two-year AS program from a PETE-accredited program.

Curriculum Design and Development Issues

- **Goal 4: Develop a curriculum framework and guide that integrate and include the standard, as well as necessary academics for materials in the sciences supporting HMMT programs.**

A fourth goal was to look at the feasibility of creating a curriculum to be used in HMMT programs. Team members developed real-world scenarios that could be used by schools to bring a realistic, hands-on approach to an HMMT program. In addition, PETE is working with IN-TELE-COM on a project called "Preserving the Legacy" to develop community college-level textbooks and training materials for use in the environmental management area. Howard Guyer, an advisory committee member and a Western PETE member, is chairing the development of the textbooks.

Johnson and other CORD staff, Steve Fenton of Scott Community College, and Doug Feil of Kirkwood Community College developed definitions, competencies, and curriculum guidelines for the HMMT skill standard. During the July 29, 1995, meeting of what the desired outcomes were reviewed. These guidelines included:

- clarifying the level of competency expected of the HMMT upon completion of a training program,
- developing a potential career path beginning in middle school and continuing through high school and junior college,
- defining a training curriculum for individuals who are unemployed by using the Tech Prep Bridge program available at many of the community colleges, and
- developing an understanding of the connection between compliance-based training and the skill standard.

An implementation guide has been written to give educators a step-by-step resource book with information about the development of the standard and the way it affects curriculum development and employment. This guide was written to ensure the maintenance and updating of the HMMT skill standard.

Defining Skill Standards: Concluding Comments

Almost three and a half years later, CORD has met the designated responsibilities in developing the National Voluntary Skills Standard for Hazardous Materials Management Technology. Project successes include bringing together business and education to agree on detailed job functions and knowledge as needed by an HMMT. But, in areas affected by the standard—education and workplace—it was, and still is, difficult to get representatives to see the importance of voluntary occupational standards over federal regulatory and state licensing requirements. After all, they are voluntary, making them difficult to enforce—even if it is for the good of the company and students. Now that the standard has been developed, the implementation is in the hands of educators and business/industry. Even though voluntary, it allows educators a tool in developing curricula and allows employers the opportunity to hire more qualified technicians.

The HMMT standard was written to provide occupationally specific job functions to those working in hazardous material fields. If the standard were to be rewritten, the CORD staff suggests focusing on a broader occupational category, for example environmental technology with hazmat falling somewhere under the umbrella. Focusing on one occupational area would have allowed staff, advisory committee members, and third-party evaluators to narrow the focus of skills and provide more detailed information. This broader focus also presented problems to those interpreting the skills. While researching to write the standard, the staff discovered a variety of definitions for a hazardous materials technician. This posed a problem regarding the level of understanding by the technician and occupational tasks performed. For example, some worksites define a hazmat technician as the person who physically cleans a contaminated site; others define it as one who designs the cleanup process and passes it to the cleanup crew. Staff and committee members decided to write the standard for a technician who has a completed two-year degree program—someone with a certain level of expertise.[3]

And, that presented another problem: business/industry and compliance of regulatory standards. In keeping current on employee training and regulatory standards, business typically sends employees through quick, remedial, OSHA-approved courses. Because the standard was written for a technician with an associate's degree and a greater depth of understanding, business/industry may find variations in what the job functions say and what employees are actually doing in the workplace. That's what makes any follow-up to the standards so important. At some point in a technicians career, these skills will be applicable. Because business/industry representatives, in our survey, agreed that graduates are lacking necessary occupational skills, those same skills cited in the HMMT standard, more importance may be placed on voluntary standards.

To date, not all business/industry representatives see the importance of voluntary skill standards, but educators are finding they are beneficial in curriculum development. Many programs around the United States[4] are turning to standards in developing curricula that will be relevant to what employers want in graduates. For example, the Hazardous Materials Training and Research Institute (HMTRI) provides short-term training, train-the-trainer programs, and hazmat technology associate degree and correspondence study programs. In developing their programs, the skill standard document was beneficial.

How Skill Standards Are Being Used[5]

Integrated System for Workforce Education Curricula

Skill standards are playing an important role in curriculum development. A project using the standards to link work and education in a meaningful and systematic manner is currently underway. Its primary goals are to integrate academic and vocational education in a curriculum framework for grades nine through fourteen, and to develop a process through which educators can elaborate upon the framework to fit it to the needs and strengths of their schools. The project, called an Integrated System for Workforce Education Curricula (ISWEC), is at the center of a dialogue among the member states of the multi-state consortium, whose representatives have played a key role in shaping the project.

The ISWEC project has compiled thirty-four standards[6] used nationwide, including the HMMT skill standards, to develop a comprehensive, integrative framework. The project is also developing and refining a process for using standards to develop curricula.

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[3] This was not stated in the standard.

[4] Other sites include: Scott Community College, Springfield Technical Community College, Delta College.

[5] Skill Standards are the base for the ISWEC project. For more information, contact Dr. Ruth Loring at 800-972-2766.

[6] Standards have been developed by various national groups representing the academic disciplines as well as some state groups. The national groups include the American Association for the Advancement of Science, the National Science Teachers Association, the National Council of Teachers of Mathematics, and many others. Workforce standards have been developed under the auspices of the National Skill Standards Board. General employability standards have come from SCANS and High Performance Workplace behaviors tentatively identified in the National Job Analysis study.

The basic premise of ISWEC is that standards must be examined and integrated. The ISWEC team has collected 7800 elements – the skills, attitudes, and knowledge cited in the workforce or skills standards, in academic standards, and in general employability skill standards. These elements have been used to develop Integrated Curriculum Standards[7] (ICS). Then ISWEC organizes ICSs in such a way that benchmarks, guidelines, and rubrics to support authentic assessment are incorporated.

Although teachers have a vital role in curriculum planning, employers should also have a voice in this activity. But for teachers and administrators who are already overtaxed to find the time and resources to identify, recruit, and work with employers is an almost overwhelming task. This is where the ISWEC project can help. By providing a framework based on the interests of representative groups from academic disciplines as well as business and industry, the project allows local educators and individual teachers to develop programs more closely suited to their local needs and strengths.

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[7] An ICS is a statement of expectation for performance that integrates workforce competencies, academic content, and employability standards.

Site Visits

Site	Date	Staff Member
Dallas Ft-Worth Sectional American Chemical Society meeting Dallas, TX	January 20, 1994	Woody Baker
EG&G of Florida Cape Canaveral, FL	August 14, 1994	Staff member
Wright-Patterson Air Force Base	September 9, 1994	
Tupperware Orlando, FL	September 14, 1994	Staff member
Kelly Air Force Base Kelly Air Force Base, TX	September 14, 1994	Jim Johnson
Marathon Power Technologies Waco, TX	September 21, 1994	Staff member
Plantation Foods, Inc. Waco, TX	September 27, 1994	Staff member
Glace & Radcliffe and Associates, Inc. Maitland, FL	September 29, 1994	Staff member
Allergan, Inc. Waco, TX	September 30, 1994	Staff member
Sherwin-Williams Company Waco, TX	October 25, 1993	Staff member
PDG Environmental, Inc. Titusville, FL	November 8, 1993	Staff member
3M Austin, TX	November 12, 1993	Staff member
Radian Corporation Austin, TX	November 12, 1993	Staff member

FINANCIAL STATUS REPORT

(Short Form)

(Follow instructions on the back)

1. Federal Agency and Organizational Element to Which Report is Submitted: U.S. Department of Education

2. Federal Grant or Other Identifying Number Assigned By Federal Agency: V244B30010-95

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Center for Occupational Research and Development
P.O. Box 21689
Waco, TX 76702

4. Employer Identification Number: 74-2077794

5. Recipient Account Number or Identifying Number: 5321

6. Final Report ☒ Yes ☐ No

7. Basis ☐ Cash ☒ Accrual

8. Funding/Grant Period (See *Instructions*) From: (Month, Day, Year) 11-01-94 To: (Month, Day, Year) 10-31-96

9. Period Covered by this Report From: (Month, Day, Year) 11-01-94 To: (Month, Day, Year) 10-31-96

10. Transactions:	I Previously Reported	II This Period	III Cumulative
a. Total outlays	-0-	518,593	518,593
b. Recipient share of outlays	-0-	261,753	261,753
c. Federal share of outlays	-0-	256,840	256,840
d. Total unliquidated obligations			-0-
e. Recipient share of unliquidated obligations			-0-
f. Federal share of unliquidated obligations			-0-
g. Total Federal share *(Sum of lines c and f)*			256,840
h. Total Federal funds authorized for this funding period			256,840
i. Unobligated balance of Federal funds *(Line h minus line g)*			-0-

11. Indirect Expense

a. Type of Rate *(Place "X" in appropriate box)* ☒ Provisional ☐ Predetermined ☐ Final ☐ Fixed

b. Rate	c. Base	d. Total Amount	e. Federal Share
24.5%	280,230	65,807	48,704

12. *Remarks: Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.* Indirect costs over the grant period were charged at the following rates for the following periods: 22.2% Final rate for costs incurred during 1994, 23.7% Final rate for costs incurred during 1995, and 24.5% provisional rate for costs incurred during 1996.

13. Certification: **I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.**

Typed or Printed Name and Title: Michael D. DeRosa, Manager of Finance

Telephone (Area code, number and extension): 817-772-8756

Signature of Authorized Certifying Official: Michael D. DeRosa

Date Report Submitted: 1-24-97

Previous Editions not Usable

Standard Form 269A (REV. 4-88)
Prescribed by OMB Circulars A-102 and A-110

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Appendix
Hazardous Materials Management Technician
Final Report

Phase One Survey (9/94)

This survey provided the advisory committee with information around which to write the skills standard.

Hazardous Materials Management Technician
Survey Questionnaire

000832

Please circle the appropriate response to the following questions

A. Are you currently employed in a HazMat field?
1. Yes
2. No

B. Current job function:
1. Administration/Management
2. Site Supervisor
3. Engineer
4. Site Technician
5. Teacher/Instructor
6. Scientist
7. Information/Data Specialist
8. Laboratory Analyst
9. Sales
10. Consultant

C. Previous or current years of HazMat experience:
1. 1-2 years
2. 3-4 years
3. 5-6 years
4. 7-8 years
5. 9-10 years
6. 11-12 years
7. 13-14 years
8. 15-16 years
9. 17-18 years
10. 19-20 years
11. 20 and up

D. How many **entry level** HazMat technicians do you routinely supervise?
1. none
2. 1-2
3. 3-4
4. 5-6
5. 7-8
6. 9-10
7. 11-12
8. 13-14
9. 15-16
10. 17-18
11. 19-20
12. 20 and up

E. U.S. Region where you are currently employed?
1. Northeast (CT, ME, MA, NH, VT, RI)
2. North central (NJ, NY, OH, PA)
3. Mid Atlantic (DE, DC, MD, NC, SC, VA, WV)
4. Southeast (AL, FL, GA, KY, TN)
5. South central (AR, LA, MS, OK, TX)
6. Midwest (IL, IN, MI, MN, MO, WI)
7. Great Plains (KS, IA, NE, ND, SD)
8. Rocky Mountains (CO, ID, MT, UT, WY)
9. West (AZ, CA, NV, NM, OR, WA)
10. Far West (AK, HI)

F. **Primary expertise** of your employer or organization:
1. Light industry/Mfg.
2. Heavy industry/Mfg.
3. Regulatory (local)
4. Regulatory (state)
5. Regulatory (federal)
6. Military/Government
7. Site Remediation
8. HazMat Trainer/Instructor
9. Analytical Laboratory
10. Disposal Site Operator
11. Environmental Consultant
12. Engineering
13. Transp/Store/Disposal
14. Chemical Mfg.
15. Medical Facility (hospital)

INSTRUCTIONS

Attached is a list of work activities performed in many HazMat jobs.

The work activities are followed by 3 areas containing columns of ovals

NOT PERFORMED: If you DO NOT perform a work activity, fill in the oval in this column and move on to the next work activity. Do not fill in any ovals an the "Importance" or "Frequency" columns.

If you DO perform a work activity, leave the oval in the "Not Performed" column blank and fill in the appropriate ovals in the "Importance" and "Frequency" columns. Remember to fill in one oval in **each** of these two groups of columns.

IMPORTANCE: Fill in the *one oval* that indicates how important the work activity is to your ability to do your job.

- **None**.....................This is of no importance to doing my job
- **Very Low**.............This is of very low importance to doing my job
- **Low**.......................This is of low importance to doing my job
- **Average**...............This is of average importance to doing my job
- **Above Average**...This is of above average importance to doing my job
- **High**......................This is of high importance to doing my job
- **Very High**.............This is essential to doing my job

FREQUENCY: Fill in the *one* oval that **most closely** represents how often you perform the work activity.

- **Yearly**................... I do this on my job approximately once each year
- **9 Months**.............. I do this on my job at least once every 9 months
- **6 Months**.............. I do this on my job at least once every 6 months
- **Monthly**................ I do this on my job at least once a month
- **Weekly**.................. I do this on my job at least once a week
- **Daily**...................... I do this on my job at least once each day
- **Hourly**................... I do this on my job at least once each hour

Example 1 represents an activity that **DOES NOT** apply to your job. The oval under the "Not Performed" column is filled in. There are no responses in the "Importance" or "Frequency" columns.

Example 2 represents an activity that **DOES** apply to your job. The "Not Performed" column is blank. The response in the "Importance" columns indicates that the activity is of **above average** importance to doing your job. The response in the Frequency" column indicates that you do this activity about **once a week**.

			IMPORTANCE								FREQUENCY						
	NOT PERFORMED		NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH		YEARLY	9 MONTHS	6 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
Example 1	●		○	○	○	○	○	○	○		○	○	○	○	○	○	○
Example 2	○		○	○	○	○	●	○	○		○	○	○	○	○	●	○

Regulations

The following is a list of regulations and related activities that HazMat technicians may need to understand. Please fill in the appropriate ovals: not performed, or importance and frequency.

REGULATIONS AND RELATED ACTIVITIES	NOT PERFORMED	IMPORTANCE							FREQUENCY						
		NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	3 MONTHS	6 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
1. 29 CFR 1910 to 1926	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
2. DOT/HMTA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3. EPA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
4. CERCLA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
5. RCRA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
6. DoD	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
7. DOE	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
8. State of X	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
9. TSCA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
10. FDA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
11. FIFRA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
12. CAA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
13. CWA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
14. SDWA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
15. NESHAP	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
16. AHERA	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
17. Identify major regulatory bodies and their jurisdiction	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
18. Describe the regulatory process	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
19. Identify and describe the penalties for non-compliance	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
20. Apply current regulatory procedures	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
21. Assure compliance with appropriate regulations	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
22. Secure permits for waste disposal	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
23. Research regulation changes and the impact the changes have on the business	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Record Keeping

Listed below are some record keeping activities/tasks that HazMat technicians may need to perform. Please fill in the appropriate oval: not performed, or importance and frequency.

ACTIVITIES	NOT PERFORMED	IMPORTANCE							FREQUENCY						
		NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	6 MONTHS	3 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
24. Compile and maintain a hazardous materials inventory	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
25. Record and maintain documentation of all waste disposal activities	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
26. Compile and maintain documentation of all hazardous materials, including field notebooks, laboratory data, vendor invoices, purchase orders, Material Safety Data Sheets (MSDS), manifests, and shipping documents	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
27. Follow project Health and Safety Plan, Initial Sampling Plan, Assessment Plan, Remediation Plan, Risk Assessment, Site Closure Plan, and Waste Minimization Plan	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
28. Assist and contribute to project reports, Health and Safety Plan, Assessment Plan, Remediation Plan, Risk Assessment, Site Closure Plan, and Remediation Plan	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
29. Compile and maintain records to prepare compliance reports for environmental permits	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
30. Verify manifesting process related to the shipping and relocating of hazardous materials	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
31. Ensure current Material Safety Data Sheets (MSDS) are available in the workplace	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
32. Utilize and Interpret MSDS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
33. Record meter and gauge readings	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
34. Operate and maintain auditable record keeping systems in accordance with regulatory requirements	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
35. Prepare, approve, sign, and maintain hazardous waste manifests,and maintain copies for inspection by regulators	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Identification and Labeling

Listed below are some activities/tasks associated with the identification and labeling of hazardous materials that HazMat technicians may need to perform. Please fill in the appropriate ovals: not performed, or importance and frequency.

ACTIVITIES

ACTIVITIES	NOT PERFORMED	IMPORTANCE							FREQUENCY						
		NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	3 MONTHS	6 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
36 Conduct and maintain a chemical inventory of hazardous materials and lab packs	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
37 Identify and label hazardous materials for shipping and storage	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
38 Identify and characterize hazardous materials and wastestreams for shipping and storage which would include appropriate warnings and regulatory requirements	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
39 Provide proper labeling instructions for all wastestreams	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
40 Employ proper labeling instructions for all wastestreams	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
41 Identify empty drums for use at various plants	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
42 Identify types of hazardous materials	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
43 Identify characteristics of the major classes of hazardous materials	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
44 Contact suppliers for product information	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
45 Generate labels and safe use instructions for materials when shipment is received	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
46 Label issued containers with appropriate identification and expiration information	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
47 Label containers of repackaged materials with hazardous material warnings as appropriate	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Emergency Response

Listed below are some emergency response activities/tasks that HazMat technicians may need to perfrom. Please fill in the appropriate ovals: not performed, or importance and frequency.

ACTIVITIES	NOT PERFORMED	IMPORTANCE							FREQUENCY						
		NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	6 MONTHS	3 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
48. Participate as a member of an emergency response team	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
49. Demonstrate ability to function individually or as a member of an emergency response team	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50. Successfully complete HAZWOPER course	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
51. Ensure adequate spill supplies are available at all times	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
52. Recognize necessary components for spill response	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
53. Participate in the development of plant emergency response programs	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
54. First Aid/CPR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Transportation and Storage

Listed below are some activities/tasks related to transportation and storage of hazardous materials that Hazmat technicians may need to perform. Please fill in the appropriate ovals: not performed, or importance and frequency.

ACTIVITIES

		IMPORTANCE							FREQUENCY						
	NOT PERFORMED	NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	3 MONTHS	6 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
55. Ensure and perform timely, routine movement of wastes from point of origin to waste pads for disposal	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
56. Verify use of appropriate containers for waste accumulation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
57. Ensure and implement sound housekeeping in hazardous waste equipment storage location	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
58. Ensure and maintain security of waste storage areas	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
59. Store hazardous waste drums properly	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
60. Recognize and ensure use of appropriate containers for waste accumulation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
61. Identify and maintain continuous inventory of empty and full containers	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
62. Conduct audits and inspections to ensure waste management activities are in compliance with local, state and federal regulatory regulations	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
63. Perform audits and investigations of waste management activities	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
64. Package, load, and ship hazardous materials/waste in compliance with appropriate regulations	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
65. Package and ship radioactive materials according to appropriate regulations	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
66. Implement proper labeling, handling, and control of hazardous materials	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
67. Direct personnel in the proper labeling, handling and control of hazardous materials	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
68. Follow written company or regulatory operating procedures	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
69. Load trailers with hazardous waste drums and empty product drums for removal from site	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
70. Perform maintenance checks for hazardous waste permit requirements at permitted storage areas	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
71. Inspect hazardous waste storage areas for compliance with appropriate rules and regulations	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
72. Conduct vendor audits	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Transportation and Storage (continued)

ACTIVITIES		IMPORTANCE							FREQUENCY						
	NOT PERFORMED	NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	9 MONTHS	6 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
73. Inspect integrity of plant tanks throughout the plant	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
74. Follow specific guidelines for patching various types of drum leaks	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Treatment and Disposal

Listed below are some activities/tasks related to treatment and disposal of hazardous materials that HazMat technicians may need to perform. Please fill in the appropriate ovals: not performed, or importance and frequency.

ACTIVITIES		IMPORTANCE							FREQUENCY						
	NOT PERFORMED	NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	9 MONTHS	6 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
75. Arrange and supervise onsite activities of waste treatment and disposal contractors	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
76. Verify and document onsite activities of waste treatment and disposal contractors	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
77. Suggest improvements in the reduction, reuse, recycling, or disposal of all wastestreams	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
78. Coordinate routine collection, draining and disposal of used containers	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
79. Operate drum crusher	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
80. Prepare accumulated stored hazardous waste for disposal	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
81. Operate pumps to transfer chemicals and fill containers	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
82. Monitor and operate volatile organic compound removal systems	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
83. Remove asbestos for disposal	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
84. Properly decontaminate personnel and equipment at a hazardous waste site	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
85. Haul process wastes from plant in hazardous waste tanks to Waste Water Treatment Plant (WWTP) for batch treatment	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
86. Operate and maintain WWTP	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
87. Implement and follow disposal processes	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Training

Listed below are some training activities/tasks that HazMat technicians may need to perform. Please fill in the appropriate ovals: not performed, or importance and frequency

		IMPORTANCE							FREQUENCY						
ACTIVITIES	NOT PERFORMED	NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	3 MONTHS	6 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
88. Complete training programs such as HazMat and HazCom	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
89. Assist in the development of promotional, educational, and instructional materials necessary to implement recycling program operation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
90. Provide on-the-job training to management staff, operations, maintenance, and administration personnel in accordance with company policy	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
91. Develop training programs for site personnel involved in hazardous materials management	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
92. Assist in establishing standard operating procedures (SOPs)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
93. Disseminate HazMat information throughout the company	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
94. Assist in the dissemination of HazMat Information throughout the company	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
95. Provide training to personnel as assigned	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
96. Provide training for members of an emergency response team	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
97. Receive and utilize training in the use of personal protective equipment, including respirators, protective clothing, and protective eyewear	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
98. Provide training in the use of personal protective equipment, including respirators, protective clothing, and protective eyewear	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
99. Complete appropriate "Train the Trainer" training program	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
100. Complete AHERA certified Facilities Survey and ManagementPlanning Asbestos Course	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Sampling and Analysis

Listed below are some sampling and analysis activities/tasks that HazMat technicians may need to perform. Please fill in the appropriate ovals: not performed, or importance and frequency

ACTIVITIES			IMPORTANCE							FREQUENCY						
		NOT PERFORMED	NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	6 MONTHS	3 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
101.	Perform and document sampling for waste characterization purposes	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
102.	Perform routine field laboratory tests according to instructions	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
103.	Operate and calibrate simple test equipment	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
104.	Perform routine maintenance of field equipment	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
105.	Perform mathematical calculations following existing formulae and standard mathematical tables	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
106.	Prepare graphs, charts, and curves from plotted and tabulated test data	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
107.	Collect, tabulate, and compute test data	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
108.	Assist engineers in the analysis of the data	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
109.	Input data for computer processing	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
110.	Collect soil samples	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
111.	Collect water samples	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
112.	Collect air samples	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
113.	Conduct field tests to analyze soil and water samples	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
114.	Collect hazardous waste samples	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
115.	Conduct laboratory tests to analyze hazardous waste samples	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
116.	Interpret laboratory sample analysis and compare it to regulatory limits	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
117.	Asbestos bulk sampling	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
118.	Collect, prepare and ship samples to authorized laboratory	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Safety (part 1)

Listed below is a list of safety related equipment that HazMat technicians should know when and how to appropriately use (including fit testing and regulatory requirements). Please fill in the appropriate ovals: not performed, or importance and frequency.

EQUIPMENT	NOT PERFORMED	IMPORTANCE							FREQUENCY						
		NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	3 MONTHS	6 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
119. Gas mask	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
120. Air Purifying Respirator (APR)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
121. Supplied Air Respirator (SAR)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
122. Steel-toed boots/shoes	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
123. Gloves	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
124. Safety glasses/goggles	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
125. Face shield	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
126. Hard hat	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
127. Coveralls	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
128. Fume hoods	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
129. Spill kits	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
130. Personal monitoring equipment	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
131. Personal protective equipment (level A, B, C, D)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Safety (part 2)

Listed below are some recognized "short-course" training topics that HazMat technicians should have taken in addition to other course work. Please fill in the appropriate ovals: not performed, or importance and frequency.

TRAINING TOPICS		IMPORTANCE							FREQUENCY						
	NOT PERFORMED	NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	6 MONTHS	3 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
132 Right to know-----HazCom	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
133 Hazardous materials handling (OSHA 24 hrs.)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
134 Fire safety	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
135 Forklift operation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
136 Transportation of hazardous materials	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
137 Respiratory protection	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
138 Lockout/tagout training	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
139 Hearing conservation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
140 Confined space entry	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
141 Electrical safety	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
142 Spill response	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
143 HAZWOPER (OSHA 40 hrs.)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
144 Laboratory safety	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
145 Asbestos abatement	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
146 Infectious waste and Blood borne pathogens	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
147 Mechanical safety	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
148 Lifting and back protection	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
149 Lead	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
150 Ladders and scaffolding	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
151 Excavation	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
152 Radiation Worker Training	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Understanding & Implementing OSHA/Equipment

Listed below are some tools and equipment that **HazMat technicians** may need to operate. Please fill in the appropriate ovals: not performed, or importance and frequency.

ACTIVITIES	NOT PERFORMED	IMPORTANCE							FREQUENCY						
		NONE	VERY LOW	LOW	AVERAGE	ABOVE AVERAGE	HIGH	VERY HIGH	YEARLY	6 MONTHS	3 MONTHS	MONTHLY	WEEKLY	DAILY	HOURLY
153. Operate fork lift	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
154. Operate drum wrenches	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
155. Operate and maintain transfer equipment	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
156. Operate and calibrate air monitoring	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
157. Operate and calibrate oxygen monitor	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
158. Utilize calometric tubes	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
159. Operate and calibrate electrical meters	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
160. Operate and maintain hand tools	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
161. Operate, calibrate, and maintain air velocity meter	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
162. Operate, calibrate, and maintain infrared monitors	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
163. Operate tugs	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
164. Operate trucks	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
165. Operate overhead hoists	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
166. Deploy containment booms	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
167. Operate and maintain triple beam and electrical balances	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
168. Operate cranes	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
169. Operate personal computers	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
170. Read gauges	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
171. Operate pumps	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
172. Operate valves	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
173. Operate and calibrate pH meter	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
174. Operate and set up automated composite water sampler	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
175. Operate grab samplers	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
176. Operate power tool	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
177. Use brooms and shovels	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

HAZARDOUS MATERIALS MANAGEMENT TECHNICIAN
SURVEY QUESTIONNAIRE

	DESCRIPTION	Avg. Score	# of srvys
	1. 29 CFR 1940 to 1926	24.17	166
	2. DOT/HMTA	16.56	167
4	3. EPA	28.38	164
[illegible]	4. CERCLA	20.01	164
5	5. RCRA	28.16	162
	6. DoD	7.38	164
	7. DOE	8.35	160
6	8. State of X	27.41	162
	9. TSCA	11.68	162
	10. FDA	4.23	166
	11. FIFRA	6.30	162
	12. CAA	11.35	165
	13. CWA	14.57	166
	14. SDWA	11.52	162
	15. NESHAP	10.14	159
	16. AHERA	8.47	163
	17. Identify major regulatory bodies and their jurisdiction	23.25	164
7	18. Describe the regulatory process	25.28	165
	19. Identify and describe the penalties of non-compliance	22.71	164
2	20. Apply current regulatory procedures	33.85	165
1	21. Assure compliance with appropriate regulations	34.41	169
—	22. Secure permits for waste disposal	12.39	168
	23. Research regulation changes and the impact the change shave on the business	19.19	167

24. Compile and maintain a hazardous materials inventory	16.78	166
25. Record and maintain documentation of all waste disposal activities	20.13	165
26. Compile and maintain documentation of all hazardous materials, including field notebooks, laboratory data, vendor invoices, purchase orders, Material Safety Data Sheets (MSDS), manifests, and shipping documents	18.42	167
27. Follow project Health and Safety Plan, Initial Sampling Plan, Assessment Plan, Remediation Plan, Risk Assessment, Site Closure Plan, and Waste Minimization Plan	21.28	168
28. Assist and contribute to project reports, Health and Safety Plan, Assessment Plan, Remediation Plan, Risk Assessment, Site Closure Plan, and Remediation Plan	19.52	168
29. Compile and maintain records to prepare compliance reports for environmental permits	15.47	167
30. Verify manifesting process related to the shipping and relocating of hazardous materials	17.72	166
31. Ensure current Material Safety Data Sheets (MSDS) are available in the workplace	15.86	166
32. Utilize and Interpret MSDS	24.28	167
33. Record meter and gauge readings	14.09	162
34. Operate and maintain auditable record keeping systems in accordance with regulatory requirements	17.77	163
35. Prepare, approve, sign, and maintain hazardous waste manifests, and maintain copies for inspection by regulators	12.33	166
36. Conduct and maintain a chemical inventory of hazardous materials and lab packs	12.82	165
37. Idnetify and label hazardous materials for shipping and storage	15.44	165
38. Identify and characterize hazardous materials and wastestreams for shipping and storage which would include appropriate warnings and regulatory requirements	16.13	160
39. Provide proper labeling insturctions for all wastestreams	14.23	166

40. Employ proper labeling insturctions for all wastestreams	15.02	163
41. Identify empty drums for use at various plants	9.61	166
42. Identify types of hazardous materials	24.74	167
43. Identify characteristics of the major classes of hazardous materials	23.19	163
44. Contact suppliers for product information	13.69	162
45. Generate labels and safe use instructions for materials when shipment is received	8.20	164
46. Label issued containers with appropriate identification and expiration information	10.38	165
47. Label containers of repackaged materials with hazardous material warnings as appropriate	11.22	165
48. Participate as a member of an emergency response team	14.78	164
49. Demonstrate ability to function individually or as a member of an emergency response team	14.78	161
50. Successfully complete HAZWOPER course	8.38	164
51. Ensure adequate spill supplies are available at all times	15.36	163
52. Recognize necessary components for spill response	17.87	164
53. Participate in the development of plant emergency response programs	11.22	166
54. First Aid/CPR	7.65	164
55. Ensure and perform timely, routine movement of wastes from point of origin to waste pads for disposal	12.98	164
56. Verify use of appropriate containers for waste accumulation	17.59	164
57. Ensure and implement sound hosuekeeping in hazardous waste equipment storage location	18.56	163
58. Ensure and maintain security of waste storage areas	14.98	164
59. Store hazardous waste drums properly	17.85	163
60. Recognize and ensure use of appropriate containers for waste accumulation	19.75	162

61. Idnetify and maintain continuous inventory of empty and full containers	12.05	165
62. Conduct audits and inspections to ensure waste management activities are in compliance with local, state and federal regulatory regulations	20.47	162
63. Perform audits and investigations of waste management activities	17.96	165
64. Package, load, and ship hazardous materials/waste in compliance with appropriate regulations	12.99	161
65. Package and ship radioactive materials according to appropriate regulations	4.47	161
66. Implement proper labeling, handling, and control of hazardous materials	17.72	165
67. Direct personnel in the proper labeling, handling and control of hazardous materials	18.28	162
68. Follow written company or regulatory operating procedures	24.15	162
69. Load trailers with hazardous waste drums and empty product drums for removal from site	7.66	163
70. Perform maintenance checks for hazardous waste permit requirements at permitted storage areas	11.77	165
71. Inspect hazardous waste storage areas for compliance with appropriate rules and regulations	19.95	165
72. Conduct vendor audits	3.82	165
73. Inspect integrity of plant tanks throughtout the plant	10.08	158
74. Follow specific guidelines for patching various types of drum leaks	5.48	158
75. Arrange and supervise onsite activities of waste treatment and disposal contractors	9.55	162
76. Verify and document onsite activities of waste treatment and disposal contractors	13.18	161
77. Suggest improvements in the reduction, reuse, recycling, or disposal of all wastestreams	18.19	162
78. Coordinate routine collection, draining and disposal of used containers	9.28	160

79. Operate drum crusher	3.49	162
80. Prepare accumulated stored hazardous waste for disposal	10.39	160
81. Operate pumps to trnasfer chemicals and fill containers	7.45	163
82. Monitor and operate volatile organic compound removal systems	6.66	160
83. Remove asbestos for disposal	3.60	160
84. Properly decontaminate personnel and equipment at a hazardous waste site	9.41	161
85. Haul process wastes from plant in hazardous waste tanks to Waste Water Treatment Plant (WWTP) for batch treatment	2.50	161
86. Operate and maintain WWTP	3.12	162
87. Implement and follow disposal processes	11.03	162
88. Complete training programs such as HazMat and HazCom	10.06	162
89. Assist in the development of promotional, educational, and instructional materials necessary to implement recycling program operation	8.41	162
90. Provide on-the-job training to management staff, operations, maintenance, and administration personnel in accordance with company policy	10.81	162
91. Develop training programs for site personnel involved in hazardous materials management	7.41	160
92. Assist in establishing standard operation procedures (SOPs)	12.28	160
93. Disseminate HazMat information throughout the company	12.18	157
94. Assist in the dissemination of HazMat information throughout the company	13.52	155
95. Provide training to personnel as assigned	13.19	160
96. Provide training for members of an emergency response team	5.98	158
97. Receive and utilize training in the use of personal protective equipment, including respirators, protective clothing, and protective eyewear	14.64	161

98. Provide training in the use of personal protective equipment, including respirators, protective clothing, and protective eyewear	9.95	160
99. Complete appropriate "Train the Trainer" training program	3.77	159
100. Complete AHERA certified Facilities Survey and Management Planning Asbestos Course	2.17	162
101. Perform and document sampling for waste characterization purposes	16.18	163
102. Perofrm routine field laboratory tests according to instructions	13.07	163
103. Operate and calibrate simple test equipment	16.25	163
104. Perform routine maintenance of field equipment	12.45	163
105. Perform mathematical calculations following existing formulae and standard mathematical tables	14.96	162
106. Prepare graphs, charts, and curves from plotted and tabulated test data	9.60	163
107. Collect, tabulate, and compute test data	11.59	162
108. Assist engineers in the analysis of the data	9.80	162
109. Input data for computer processing	12.35	157
110. Collect soil samples	12.50	160
111. Collect water samples	15.39	163
112. Collect air samples	10.13	161
113. Conduct field tests to analyze soil and water samples	10.51	159
114. Collect hazardous waste samples	15.04	162
115. Conduct laboratroy tests to analyze hazardous waste samples	4.79	162
116. Interpret laboratyr sample analysis and compare it to regulatory limits	18.29	164
117. Asbestos bulk sampling	5.22	161
118. Collect, prepare and ship sampels to authorized laboratory	15.70	164
119. Gas mask	10.27	155

120. Air Purifying Respirator (APR)	16.18	161
121. Supplied Air Respirator (SAR)	12.39	159
122. Steel-toed boots/shoes	22.53	158
123. Gloves	25.38	161
124. Safety glasses/goggles	27.21	159
125. Face shield	16.97	158
126. Hard hat	21.68	158
127. Coveralls	17.51	160
128. Fume hoods	1.13	160
129. Spill kits	15.56	160
130. Personal monitoring equipment	16.71	161
131. Personal protective equipment (level A, B, C, D)	20.02	160
132. Right-to-know ----- HazCom	12.16	160
133. Hazardous materils handling (OSHA 24 hrs.)	9.24	160
134. Fire safety	8.61	159
135. Forklift operation	2.93	157
136. Transportation of hazardous materials	8.28	159
137. Respiratory protection	11.44	160
138. Lockout/tagout training	5.58	159
139. Hearing conservation	7.06	158
140. Confined space entry	7.27	158
141. Electrical safety	6.15	157
142. Spill response	9.51	160
143. HAZWOPER (OSHA 40 hrs.)	7.17	158
144. Laboratory safety	5.30	157
145. Asbestos abatement	3.37	156
146. Infectious waste and Blood borne pathogens	5.60	158
147. Mechanical safety	5.04	158
148. Lifting and back protection	6.65	158
149. Lead	6.77	157

150. Ladders and scaffolding	4.14	157
151. Excavation	6.01	157
152. Radiation Worker Training	3.80	160
153. Operate fork lift	5.20	158
154. Operate drum wrenches	11.31	157
155. Operate and maintain transfer equipment	7.89	157
156. Operate and calibrate air monitoring	13.08	159
157. Operate and calibrate oxygen monitor	12.85	158
158. Utilize calometric tubes	9.02	157
159. Operate and calibrate electrical meters	6.87	158
160. Operate and maintain hand tools	12.88	156
161. Operate, calibrate, and maintain air velocity meter	6.24	158
162. Operate, calibrate, and maintain infrared monitors	4.39	159
163. Operate tugs	2.09	158
164. Operate trucks	7.46	158
165. Operate overhead hoists	4.49	155
166. Deploy containment booms	5.46	157
167. Operate and maintian triple beam and electrical balances	3.96	157
168. Operate cranes	2.12	157
3 169. Operate personal computers	29.10	158
170. Read gauges	17.10	158
171. Operate pumps	10.89	157
172. Operate valves	10.58	158
173. Operate and calibrate pH meter	12.81	155
174. Operate and set up automated composite water sampler	8.26	159
175. Operate grab samplers	11.48	159
176. Operate power tool	9.50	160
177. Use brooms and shovels	12.04	158

Survey Used to Write Skills Standard

This survey was sent to approximately 300 business/industry representatives to pinpoint skills that needed to be included in the skills standard.

CORD/J. Johnson
HazMat Skill Standards/5320
04/27/94

NATIONAL SKILLS STANDARD PROJECT
HAZARDOUS MATERIALS MANAGEMENT TECHNICIAN SURVEY

To help us accurately define the skills needed for Hazardous Materials Management Technicians to be successful in their occupations, we need your help. The enclosed material will help define the requirements of the occupation. Knowing some details about your background and experience will help us analyze the information. Please answer the following questions about yourself and your organization.

1. About you
   Your age: 20-29____, 30-39_____, 40-49_____, 50-59_____, >60_____
   Your sex: M____, F____
   Years of Environmental work experience, <5____, 5-9____, 10-19____, >20___

2. Your education

A. Degree or Diploma	Speciality
none	------
high school	------
Associate of Science (AS or AAS)	________________
Bacholar Degree (BS, BT, BA)	________________
Masters Degree (MS, MA, MBA, etc)	________________
Doctors Degree (PhD, EdD, etc.)	________________

3. Which best describes your current job function
   Administration/Management
   Technician
   Engineer
   Scientist
   Teacher/Instructor
   Salesman
   Other (please specify)________________________

4. Which best describes your organization
   Chemical / Petrolum Producer______, Municipality_______, Military___________
   Government Laboratory _______, Professional Society________, Education_________
   Private Research Laboratory_______
   Manufacturing (please specify type or product__________________________)
   Consulting (please specify the speciality ___________________)
   Labor Union Representative(please specify__________________)
   Other (please specify__________________________)

5. Number of employees in your organization___________ 6. Principle location (state)______

7. Do you or your organization employ Hazardous Materials Management Technicians? If yes, list job titles. If no, who is responsible for hazardous materials management issues like training, regulations, emergency response, etc.?

8. Do you or your organization employ people with training in Environmental Science? In what capacity? Please list job titles.

9. What is your organization's, single, most critical concern relative to hazardous materials management.

HAZARDOUS MATERIAL MANAGEMENT TECHNICIAN TASK/ACTIVITY ANALYSIS

***INSTRUCTIONS FOR SECTION A:** The following is a list of environmental regulations that HazMat Technicians may need to understand. Help identify the level of knowledge that a technician needs to understand these regulations by choosing a verb from the list (or other verb) that best describes the technicians work. Please add regulations that may be missing or draw a line through any that are not needed. In the left margin place a "1", "2", or "3" to indicate the three most important regulations.*

A. Regulations

1. Knowledge of the following regulations

   a. 29 CFR 1900 to 1926

   b. DOT

   c. EPA

   d. CERCLA

   e. RCRA

   f. DoD

   g. DOE

   h. State of X

***INSTRUCTIONS FOR PART 2:** Evaluate the following tasks that HazMat technicians may perform. Pay particular attention to the underlined verbs. If the given verbs are not correct, please select another one from the list provided or suggest an alternate. If the activity is not required of HazMat technicians cross it out, but add additional tasks when appropriate. In the left margin, place the number "1" for the highest priority task, a number "2" for the next most important task and the number "3" for next. Only the top three tasks need to be ranked.*

2. Activities related to regulations

   a. Identify major regulatory bodies and their jurisdiction

   b. Describe the regulatory process

   c. Identify and describe the penalties for non-compliance

   d. Apply current regulatory procedures

   e. Assure compliance with appropriate regulations

   f. Secure permits for waste disposal.

   g. Research regulation changes and evaluate the impact the changes have on the business.

INSTRUCTIONS FOR SECTION B: Listed below are some record keeping activities/tasks that HazMat technicians may need to perform. Consider the underlined verb. If it is not correct, replace it with one from the attached verb list or a similar verb. If the task is not performed by a HazMat technician cross it out. Add others if necessary. In the left margin place a "1", "2" or "3" to indicate the three most important activities.

B. Record Keeping

1. Maintain a Hazardous Waste inventory
2. Record and maintain documentation of all waste disposal activities
3. Approve waste disposal vendor invoices
4. Generate project reports such as Health and Safety report, Initial Sampling Plan, Assessment Plan, Remediation Plan, Risk Assessment, Site Closure Plan.
5. Prepare records for National Pollutant Discharge Elimination System (NPDES).
6. Maintain sewage logs
7. Design reports to confirm that existing products are coded correctly.
8. Verify manifesting process related to the shipping and relocating of hazardous materials
9. Review purchase reports for new products
10. Complete and submit regulatory reports such as manifests, updates, plans and correspondence.
11. Prepare reports on audits and inspections
12. Ensure current Material Safety Data Sheets (MSDS's) are available in the workplace.
13. Record meter and gauge readings
14. Maintain a laboratory notebook which includes test results
15. Develop and maintain auditable record keeping systems in accordance with regulatory requirements.
16. Prepare, approve, sign and maintain hazardous waste manifests, maintain copies for inspection by regulators
17. Write MSDS's for new products
18. Set-up, operate and administer record keeping systems

***INSTRUCTIONS FOR SECTION C:** Listed below are some activities/tasks associated with the identification and labeling of hazardous materials that HazMat technicians may need to perform. Consider the underlined verb. If it is not correct, replace it with one from the attached verb list or a similar verb. If the task is not performed by a HazMat technician cross it out. Add others if necessary. In the left margin place a "1", "2" or "3" to indicate the three most important activities.*

C. Identification and Labeling

1. Conduct a chemical inventory of waste materials and lab packs.
2. Identify and label hazardous material for shipping or storage.
3. Provide proper labeling instructions for all waste streams
4. Color code empty drums for use at various plants
5. Identify types of hazardous materials
6. Identify major characteristics of hazardous materials
7. Develop and design product labels for new commercial products
8. Contact suppliers for product information
9. Generate labels and Safe Use Instructions for materials as shipment is received.
10. Label issued containers with applicable identification and expiration information.
11. Label containers of repackaged materials with hazardous material warnings as appropriate.

***INSTRUCTIONS FOR SECTION D:** Listed below are some emergency response activities/tasks that HazMat technicians may need to perform. Consider the underlined verb. If it is not correct, replace it with one from the attached verb list or a similar verb. If the task is not performed by a HazMat technician cross it out. Add others if necessary. In the left margin place a "1", "2" or "3" to indicate the three most important activities.*

D. Emergency Response

1. Participate as a member of an emergency response team
2. Lead an emergency response team.
3. Attend a certified HAZWOPER course
4. Maintain spill carts
5. Ensure adequate spill supplies are available at all times.
6. Participate in the development of plant emergency response programs
7. Ensure Plant Spill Response team's readiness--staffing, training, equipment
8. Develop a hazardous materials emergency response plan.

***INSTRUCTIONS FOR SECTION E:** Listed below are some activities/tasks related to transportation and storage of hazardous materials that HazMat technicians may need to perform. Consider the underlined verb. If it is not correct, replace it with one from the attached verb list or a similar verb. If the task is not performed by a HazMat technician cross it out. Add others if necessary. In the left margin place a "1", "2" or "3" to indicate the three most important activities.*

E. Transportation and Storage

1. Ensure timely, routine movement of wastes from point of origin to waste pads for disposal
2. Verify use of appropriate containers for waste accumulation
3. Ensure sound housekeeping in hazardous waste and equipment storage locations.
4. Ensure security of waste storage areas
5. Store hazardous waste drums properly
6. Color-code empty drums to identify acceptable uses
7. Ensure use of appropriate containers for waste accumulation
8. Maintain continuous inventory of full and empty waste containers
9. Assure adequate inventory of empty drums for routine waste accumulation.
10. Conduct audits and investigations to assure waste management activities are in compliance with appropriate local, state, federal and agency regulations.
11. Package and ship hazardous materials/waste in compliance with appropriate regulations
12. Package and ship radioactive materials according to appropriate regulations
13. Direct personnel in the proper labeling, handling and control of hazardous materials.
14. Review company's operating procedures to assure they are in compliance with applicable regulations
15. Conduct field audits of the procedures to verify their effective implementation by other personnel.
16. Load trailers with hazardous waste drums and empty product drums for removal from site.

17. Perform maintenance checks for hazardous waste permit requirements at permitted storage areas

18. Inspect hazardous waste storage areas for compliance with appropriate rules and regulations.

19. Inspects integrity of plant tanks throughout the plant

20. Follow specific guidelines for patching various types of drum leaks.

INSTRUCTIONS FOR SECTION F: Listed below are some activities/tasks related to treatment and disposal of hazardous materials that HazMat technicians may need to perform. Consider the underlined verb. If it is not correct, replace it with one from the attached verb list or a similar verb. If the task is not performed by a HazMat technician cross it out. Add others if necessary. In the left margin place a "1", "2" or "3" to indicate the three most important activities.

F. Treatment and Disposal

1. Arrange and supervise on-site activities of waste treatment and disposal contractors.
2. Suggest improvements in the reduction, reuse, recycling or disposal of all waste streams.
3. Arrange for purchase and disposal of empty drums
4. Coordinate routine collection, draining, and disposal of used containers
5. Operate drum crusher
6. Prepare accumulated stored hazardous waste for disposal by deciding if it should be
    a. prepared for sale
    b. processed by chemical treatment
    c. picked up for outside disposal
7. Operate pumps to transfer chemicals and fill containers
8. Monitor and operate volatile organic compound removal systems
9. Remove asbestos for disposal
10. Decontaminates equipment used at a hazardous waste site.
11. Install a groundwater monitoring well.
12. Haul process wastes from plant in hazardous waste tanks to WWTP for batch treatment
13. Operate and maintain Waste Water Treatment Plant.

***INSTRUCTIONS FOR SECTION G:** Listed below are some training activities/tasks that HazMat technicians may need to perform. Consider the underlined verb. If it is not correct, replace it with one from the attached verb list or a similar verb. If the task is not performed by a HazMat technician cross it out. Add others if necessary. In the left margin place a "1", "2" or "3" to indicate the three most important activities.*

G. Training

1. Evaluate training regarding HazMat and HazCom
2. Develop promotional, educational and instructional literature necessary to implement recycling program operations
3. Develop and present public education programs
4. Provide on-the-job-training to management staff, operations, maintenance and administration personnel in accordance with company policy
5. Develop training programs for site personnel involved in waste management work.
6. Assist in establishing standard operation procedures (SOP's)
7. Disseminate HazMat information throughout the company
8. Provide training to personnel as assigned.
9. Provide training for members of an emergency response team
10. Provide training in the use of personal protective equipment, including respirators, protective clothing and protective eyewear
11. Develop a training program for drivers who transport hazardous materials.

INSTRUCTIONS FOR SECTION H: Listed below are some sampling and analysis activities/tasks that HazMat technicians may need to perform. Consider the underlined verb. If it is not correct, replace it with one from the attached verb list or a similar verb. If the task is not performed by a HazMat technician cross it out. Add others if necessary. In the left margin place a "1", "2" or "3" to indicate the three most important activities. Fill in the blanks in responses #3 and #20.

H. Sampling and Analysis

1. Perform and document sampling for waste characterizations purposes.
2. Perform routine laboratory tests according to detailed instructions
3. Operate and calibrate simple test equipment.
4. Repair and/or replace damaged or malfunctioning equipment
5. Perform mathematical calculations following existing formulae and standard mathematical tables
6. Prepare graphs, charts, and curves from plotted and tabulated test data.
7. Collect, tabulate and compute test data and assist engineers in the analysis of the data .
8. Input data for computer processing
9. Collect soil samples
10. Collect water samples
11. Collect air samples
12. Monitor air quality
13. Monitor water quality
14. Conduct laboratory tests to analyze soil samples
15. Conduct laboratory tests to analyze water samples
16. Conduct field tests to analyze soil and water samples
17. Collect hazardous waste sample
18. Conduct laboratory tests to analyze hazardous waste sample
19. Interpret laboratory sample analysis and compares it to regulatory limits.
20. Calibrate laboratory equipment.

INSTRUCTIONS FOR SECTION II: Listed below is a list of safety related equipment that HazMat technicians may need to use. Cross out any devices that do not apply and add others that may be missing.

I. Safety

1. Know when and how to used the following personal protective equipment (PPE)

    a. dust mask

    b. cartridge respirator

    c. self contained breathing apparatus

    d. steel-toed boots

    e. gloves

    f. safety glasses

    g. goggles

    h. face shield

    i. hard-hat

    j. coveralls

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INSTRUCTIONS FOR SECTION I2: Listed below are some recognized "short-course" training topics that HazMat technicians should have taken in addition to other course work. Consider the given topic and cross it out if the topic is not necessary. To compare the importance of each give an estimate of the number of hours of training desired for each topic. Place a "1", "2" or "3" in the left margin to indicate the three most important topics.

2. Understand and implement the training requirements of OSHA and other agencies regarding:

    a. Right-to-know----HazCom

    b. Hazardous Materials Handling (OSHA 24 hrs)

    c. Fire Safety

    d. Forklift Operation

    e. Lifting and Back Protection

    f. Transportation of Hazardous Materials

    g. Respiratory Protection

    h. Lockout/Tagout Training

    i. Hearing Conservation

    j. Confined Space Entry

    k. Electrical Safety

***INSTRUCTIONS FOR SECTION J:** Listed below are some tools and equipment that HazMat technicians may need to operate. Choose a verb from the attached list or a similar verb that most closely describes the involvement that a HazMat technician will have with the tool or equipment. If the tool or equipment is not used by a HazMat technician cross it out. Add others as necessary. In the left margin place a "1", "2" or "3" to indicate the three most important tools used.*

J. Equipment

1. fork lift
2. drum wrenches
3. transfer equipment
4. air monitoring
5. absorbents
6. neutralizers
7. oxygen monitor
8. calorimetric tubes
9. electrical meters
10. hand tools
11. air velocity meter
12. infrared monitors
13. tugs,
14. trucks
15. overhead hoists
16. floats
17. triple beam and electronic balances
18. microscope
19. microwave ovens
20. cranes

21. personal computers
22. gauges
23. pumps
24. valves
25. pH meter
26. automated composite water sampler
27. grab samplers, water and waste

***INSTRUCTIONS FOR SECTION K:** Listed below is a list of materials that HazMat technicians may control or work with. Add to the list or give a more complete description of the materials already on the list. In the left margin place a "1", "2" or "3" to indicate the three most common materials encountered.*

K. Materials Encountered

1. solvents and thinners
2. chemicals
3. paints
4. oils
5. fuels
6. asbestos
7. toluene
8. trichloroethane
9. acetone
10. alcohol
11. plastic resins
12. acrylic cements
13. fiberglass
14. liquid nitrogen
15. dry ice
16. toxic or semi-toxic metals

Survey Used as Validation

This survey was used to validate the knowledge/skills prior to including them in the standard.

JOB FUNCTION (A):
Evaluate hazardous materials and hazardous waste sample data.

Supporting knowledge/skills:

A1. Perform mathematical calculations following existing formulas and reference materials

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

A2. Read and interpret blueprints, charts, curves, graphs, maps, plans, and spreadsheets from plotted and tabulated data

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

A3. Collect, tabulate, and assist in the evaluation of data, using appropriate techniques and technology such as:

- **calculators**
- **computers**
- **databases**
- **graphics**
- **spreadsheets**

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness			Application				Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

A4. Check laboratory and/or field sample analyses by comparing to regulatory limits

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

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JOB FUNCTION (B):
Safely handle hazardous materials and hazardous wastes.

Supporting knowledge/skills:

B1. Use chemical reference materials to obtain information on proper chemical handling

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

B2. Recognize, apply, and respond appropriately to chemical-hazard information

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

B3. Direct personnel in the proper handling and control of hazardous materials and hazardous wastes

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

B4. Identify and implement safe ergonomic controls and procedures

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

B5. Demonstrate safe handling procedures for chemical containers such as:
bulk containers
drums
portable and stationary tanks

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

B6. Identify and respond to emergencies, alarms, and abnormal situations in accordance with written procedures

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

B7. Identify and implement safe chemical-handling procedures such as:
bonding
fire control
grounding
storage
vapor control
ventilation

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

B8. Provide on-the-job training as required

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

JOB FUNCTION (C):
Respond to hazardous-materials and hazardous-waste emergency situations in accordance with regulatory requirements.

Supporting knowledge/skills:

C1. Perform as a team member on an emergency-response team

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

C2. Ensure that adequate spill-control equipment and supplies are available at all times

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

C3. Develop and implement an emergency-response program

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

C5. Demonstrate competency and maintain certification in first aid and Cardio-Pulmonary Resuscitation

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

C5. Follow guidelines for controlling leaks from containers

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

C6. Consider environmental consequences of emergency situations and respond appropriately

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

JOB FUNCTION (F):
Calibrate, operate, and maintain instrumentation.

Supporting knowledge/skills:

F1. Operate, record, and evaluate meter- and gauge-reading trends and implement appropriate actions

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

F2. Perform routine maintenance of equipment and instrumentation

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

F3. Operate gauges, meters, and monitoring and sampling instrumentation

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

F4. Calibrate and operate field and laboratory instrumentation such as:
air-monitoring instrumentation
groundwater-monitoring instrumentation
soil-monitoring instrumentation
solid-waste-monitoring instrumentation
surface-water-monitoring instrumentation

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

F5. Identify the need for and comply with factory calibration

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

F6. Describe the difference between fluid and factory calibration and demonstrate their appropriate use

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

JOB FUNCTION (G):
Compile, record, and maintain required documents for hazardous-materials and hazardous-waste management activities.

Supporting knowledge/skills:

G1. Compile and maintain a hazardous-materials inventory

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

G2. Compile and maintain documentation of hazardous materials, such as:

chain of custody
equipment calibration and maintenance
exception reports
field notebooks
incident documentation
laboratory data
manifests
MSDSs
purchase orders
shipping documents
vendor invoices

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

G3. Compile and maintain records to prepare compliance reports

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

G4. Ensure current MSDSs are available in the workplace

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application				Mastery
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

G5. Operate and maintain auditable record-keeping systems in accordance with regulatory requirements

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

G6. Conduct and maintain a hazardous-waste inventory

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

G7. Communicate with suppliers to obtain product identification and labeling

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

G8. Identify and maintain an inventory of empty and full containers

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

G9. Compile and maintain personal health and safety records

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

G10. Read and interpret blueprints, flow diagrams, and schematics

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

JOB FUNCTION (H):
Implement procedures to comply with appropriate regulations.

Supporting knowledge/skills:

H1. Read and apply regulatory standards to ensure compliance in operations

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

H2. Obtain hazardous-materials and hazardous-waste permits and/or approvals

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

H3. Describe the regulatory process, from the introduction of a bill to the promulgation of a regulation

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

H4. Identify and describe the penalties for noncompliance

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

H5. Differentiate between federal, state, and local hazardous materials and hazardous waste regulations and identify appropriate regulatory agencies

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

H6. Identify regulatory changes and the impact they have on an operation

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

H7. Comply with federal, state, and local hazardous-materials regulations

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

H8. Conduct audits and inspections to ensure hazardous-waste management activities are in compliance with federal, state, and local regulations

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

H9. Follow written, company-standard operating procedures

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

H10. Comply with federal, state, and local health and safety regulations

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application			Mastery
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

H11. Identify sources of current or timely regulatory information

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

JOB FUNCTION (I):
Implement applicable safety regulations and procedures.

Supporting knowledge/skills:

I1. Demonstrate safe health and work habits

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

12. Read and implement regulatory standards and guidance relative to worker safety and health such as:

blood-borne pathogens
confined space
emergency egress
fire safety
hearing conservation
lockout/tagout

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

13. Identify and describe unsafe workplace and job conditions and implement corrective actions

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

JOB FUNCTION (J):
Select and use appropriate personal protective equipment and respiratory protection.

Supporting knowledge/skills:

J1. Use and interpret chemical reference materials in the selection of appropriate personal protective equipment (PPE) and respirators

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10	
LAT	0	1	2	3	4	5	6	7	8	9	10	
CRT	0	1	2	3	4	5	6	7	8	9	10	
FORT	0	1	2	3	4	5	6	7	8	9	10	
TSTD	0	1	2	3	4	5	6	7	8	9	10	

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

J2. Communicate with suppliers and manufacturers to obtain personal protective and respiratory equipment information

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application			Mastery
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

J3. Identify, describe, and use PPE appropriate to the work conditions

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

J4. Identify and describe the elements of respiratory protection and PPE plans

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness			Application				Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

J5. Identify, describe, and use respiratory protection appropriate to the work conditions

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

J6. Identify and describe hazards associated with the use and limitations of PPE and respiratory protection

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

J7. Maintain and inspect PPE and respiratory protection systems according to regulations

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

JOB FUNCTION (K):
Collect, prepare, document, and ship samples for analysis.

Supporting knowledge/skills:

K1. Perform and document sampling for hazardous-waste characterization purposes

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

K2. Perform field tests according to instructions and procedures

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

K3. Calibrate and operate, as required, field-test equipment such as:

air-monitoring equipment
bailers
hand augers
organic-vapor analyzers
pumps
radioactivity measuring equipment
split spoons

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

K4. In accordance with instructions and/or procedure, collect samples such as:

air and soil
bulk materials
groundwater
solid wastes
surface water

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

K5. Identify and demonstrate an ability to adjust procedures appropriately for potential sample interferences

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness			Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

K6. Decontaminate equipment in accordance with quality-control/quality-assurance procedures

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

K7. Identify and describe the appropriate use, limitations, and applications of sampling equipment such as:

colorimetric indicator
combustible-gas indicator
organic-vapor analyzer

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

K8. Perform personnel-exposure monitoring in accordance with appropriate standards such as:

noise monitoring
oxygen monitoring
radiation dosimetry
temperature extremes
threshold limit value—biological-exposure indices

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

K9. Prepare and ship samples to laboratory

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

JOB FUNCTION (L):
Transport and store hazardous materials and hazardous waste in accordance with applicable regulations.

Supporting knowledge/skills:

L1. Monitor documentation related to the shipment of hazardous materials and hazardous wastes

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

L2. Identify incompatible combinations of chemicals that could result in dangerous situations

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

L3. Label containers with appropriate identification and expiration information

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

L4. Safely package, load, document, and ship hazardous materials and hazardous wastes in compliance with appropriate regulations

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

L5. Inspect hazardous-waste storage areas for compliance with appropriate rules and regulations

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

L6. Properly segregate and store incompatible hazardous materials and hazardous wastes

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

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JOB FUNCTION (M):
Operate hazardous-materials and hazardous-waste treatment and disposal systems.

Supporting knowledge/skills:

M1. Record and maintain documentation of operations activities

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M2. Follow appropriate plans such as:

assessment plan
health and safety plan
initial sampling plan
remediation plan
risk-assessment plan
site-closure plan
standard operating procedures
waste-minimization plan

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M3. Assist and contribute to the development and revision of plans and reports such as:

- **assessment plan**
- **health and safety plan**
- **initial sampling plan**
- **remediation plan**
- **risk-assessment plan**
- **site-closure plan**
- **standard operating procedures**
- **waste-minimization plan**

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M4. Prepare and maintain hazardous-waste manifests and associated documents for inspection

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M5. Select appropriate drums and containers

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M6. Implement good housekeeping practices in the workplace

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M7. Check and document activities of hazardous-waste treatment and disposal contractors

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application		Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M8. Working individually or with others, develop improvements in the reduction, reuse, recycling, or disposal of waste streams

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M9. Coordinate collection and disposal of empty containers

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed			Awareness				Application			Mastery
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M10. Prepare accumulated hazardous waste for proper disposal

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M11. Identify and describe treatment, removal, and disposal systems such as:

bio-remediation
chemical and physical
deep-well injection
incineration
vitrification
volatile organic compounds

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application				Mastery
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M12. Identify and describe hazards associated with abatement of materials such as:

asbestos
fiberglass
lead

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M13. Identify and describe hazards associated with treatment, removal, and disposal systems and operations

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

M14. Provide on-the-job training as required

a) Give job oriented examples applicable to an HMMT:

b) For each area of technician specialization, select the appropriate level of accomplishment.

	Not Needed		Awareness				Application			Mastery	
All	0	1	2	3	4	5	6	7	8	9	10
LAT	0	1	2	3	4	5	6	7	8	9	10
CRT	0	1	2	3	4	5	6	7	8	9	10
FORT	0	1	2	3	4	5	6	7	8	9	10
TSTD	0	1	2	3	4	5	6	7	8	9	10

c) List background/supporting knowledge necessary to successfully complete this task:

d) List unique or specific attitudes (character traits):

e) Assessment technique or procedure

f) Schoolsite activity

g) Worksite activity

Meeting Information (1 example)

Minutes of

Meeting Minutes

Hazardous Materials Management Skill Standard

Advisory Subcommittee on Certification

July 14 - 15, 1994

Roney Teaching Center, Waco, TX

Purpose of the Meeting:

Review current certification programs related to hazardous materials management that are maintained by professional societies. Investigate certification and licenser programs in other technology areas. Structure a framework that can be used for certification of Hazardous Materials Management Technicians that will be consistent with the Skills Standard being developed.

Meeting Activities:

Walt Edling, Vice President for Service Programs at CORD, gave an introduction to CORD and to the HazMat Skill Standard Project. He set the stage by explaining the importance of skill standards to the overall educational system and how they fit into a seamless curriculum leading from school to an occupation. Assessment and certification of the occupational skill plays a key role in this curriculum.

Jim Johnson give a review of the project activities to date and those activities planned for the remainder of the project. It was explained that Reggi Moore from NEHA will assist with the development of an industrial survey. He will begin by incorporating recommendations made during several focus group meetings into the current version of the task/activity outline. Particularly, recommendations made be advisory committee members during the June 17 Advisory Committee Meeting in Fort Worth will be integrated into the outline. A survey will be prepared from the results.

The representative of each professional society present gave an overview of the certification program they are affiliated with. This included the following:

Rick Richardson	NETA	Certified Environmental Trainer (CET)
Reggie Moore	NEHA	Registered Hazardous Substances Specialists
Dan McGrew	HMCRI	
Jim Talley	NAEP	Certified Environmental Professionals I.P.E.P
Jean Drevdahl	ABIH/BCSP	CSP

Certification and licensing associated with other technologies was investigated also. Jean Drevdahl explained the licensing requirements associated with nursing at different levels. Similarities and differences between state requirements was also discussed. Alan Sosbe gave an overview of the ASE certification for Automotive Technology. The ASE and NATEF have developed a process to certify training programs as well as individuals. This model appeared to have many similarities with the goals of the HazMat Skills Standard Certification efforts.

Valerie Sherwood explained the work that she was involved relative to assessment in the Skill Standards programs in Great Britain. Assessment is the key to a successful certification program. Several comments and questions were raised about "performance based" assessment. Although it was agreed that this was a desirable component of a certification program for technicians, care must be taken to assure that assessors are using common guidelines for the assessment procedures. A reasonable method for technician certification may be to have the performance bases assessment accomplished during a training program rather than as part of a comprehensive exam at the end of the training program.

The meeting reconvened on Friday morning with group discussions. Each group was to design a certification framework and to make recommendations for future activities in this area. The summation of the discussions showed the following:

a. pursues certification of training programs and of individuals completing those programs.
b. attempt to work within an existing structure, such as the Partnership for Environmental Technology Education (PETE) for the certification of training programs.
c. A comprehensive examination with a performance based component should be established for technicians. PETE as well as professional societies can provide this type of certification.
d. in addition to a comprehensive certification, individuals should have the opportunity to be certified for specific specialties. These may include asbestos, lead, nuclear, etc.
e. the Hazardous Materials Management Technology Skill Standard must be complete enough to serve as the basis for any certification program. It must also be accurate and include all aspects of the technology.
f. each committee member agreed to evaluate the outline of skills to verify that is complete and accurate before NEHA completes and mails the survey form.
g. the professions societies represented, agree to use their mailing lists to help distribute the survey to as wide of an audience as possible.
h. arrangements will be made by Rick Richardson to discuss these concepts with the PETE Board of Directors.

Attached is the agenda for the meeting and a list of attendees.

Competency Certification Programs

by Charles L. Richardson

What is Certification?

cer-ti-fi-ca-tion *n. Abbr.* **cert.** **1.** The act of certifying or certificating. 2. The state of being certified. **3.** A certified statement.

cer-ti-fy *v.* **-fied, -fying, -fies**. --*tr.* **1. a.** To confirm formally as true, accurate, or genuine; testify to or vouch for in writing. **b.** To guarantee as meeting a standard; attest.

cer-ti-fied *adj. Abbr.* **cert**. **1**. Guaranteed in writing; vouched for; endorsed. **2**. Holding a certificate.

- *The American Heritage Dictionary of the English Language*

In specific reference to educational, training, or professional certification or *designation* programs, the term "certification" has a more specific meaning: the process or procedure of certifying an individual as *minimally competent and/or experienced* in a particular endeavor. In this specific context, there are two basic but slightly different types of certification. These differences can cause confusion when two people are discussing certification, but have different types of certification in mind. The two basic types of certification are:

- ***Voluntary***. Voluntary certifications are those that people elect to acquire. People usually elect to acquire a certification to demonstrate to the public, employers, or potential employers that an independent third party has examined and approved their knowledge, capabilities, experience, or some combination of these. The independent party then attests, usually in writing, that the individual meets minimum standards of knowledge, capability, or experience. Most voluntary certifications are offered by professional associations and societies.

- ***Mandatory***. Mandatory certifications are those required by a responsible authority, often a state government, so that a person may be permitted to perform certain tasks or work in a designated profession. Mandatory certifications also usually entail an examination of knowledge, capabilities, experience, or some combination of these. Although the purpose of mandatory certification also is to determine that a person possesses minimum knowledge, capabilities, or experience, the examining party is not necessarily independent. For example, state regulatory agencies often develop and administer their own exams. In many situations, mandatory certification is similar to licensing.

Complicating the discussion of certifications even further is the fact that some *voluntary* certifications have been made *mandatory* (or effectively mandatory) by employers and government authorities. Many governmental entities will accept documentation, applications, etc. only if submitted or countersigned by an individual with a specified certification. This is seen primarily in engineering, medical and public health areas. In the private sector, professional certifications are increasingly being required by some employers as a condition of obtaining or retaining employment. Since the promulgation of many new federal regulations by the U.S. EPA, OSHA, and Department of Transportation mandating training in environmental or environmental health and safety areas, my own organization has witnessed its certification, the Certified Environmental Trainer (CET) become required by many companies for employment or retention of employment in the field. Some municipalities, states, and federal entities (primarily the armed services) now have the CET as a contract preference item, if not a requirement.

What are "Certificate" Programs?

In addition to *certifications*, discussed above, there also are *certificate* courses or programs offered by a variety of organizations. Certificate programs are those for which a certificate of completion is provided following a course, seminar, workshop, or related collection of these. Certificate programs often are confused with true certification programs, and some vendors of the programs purposely encourage this confusion.

This is not to suggest negativity toward all certificate programs. Many programs are entirely reputable and appropriate for their purpose. They are offered by educational institutions and reputable professional associations, often as continuing education or by continuing education departments, and constitute good (or at least adequate) education or training. Those offered by educational institutions usually are directed to an audience that has a personal stake in getting the maximum amount of information or training from the program. This offers a level of assurance that students/attendees go away with increased knowledge or competency. But, there *usually* is no assurance of this, as certificate programs seldom include tests of any kind.

Some certificate programs are offered only because some authority, often a state or federal agency, has mandated some type of training (but have not also mandated minimum demonstrated results from the training on the part of the students/attendees). Employers are then obliged to seek some way of meeting often ill-defined requirements. Naturally, when there are dollars to be made, someone will step forward to earn them. Some vendors respond properly and provide a competent curriculum; others haven't the interest, experience, or knowledge to do so. Also, vendors in the latter category also know that generally the students/attendees at these programs have no personal stake in attending, but are there simply to get a "ticket punched." Knowing this, they feel no obligation to do more than assure that the "ticket" is indeed "punched."

What are Designations?

des-ig-na-tion *n.* **1.** The act of designating; a marking or point out. **2.** Nomination or appointment. **3.** A distinguishing name or mark; title.

- *The American Heritage Dictionary of the English Language*

Professional and technical certification usually is accompanied by a "designation." We are all familiar with designations conferred with educational degrees, such as Ph.D, M.D., and D.D.S., and such association-conferred designations as C.P.A. Somewhat less common, but also widely recognized are such designations as P.E. (Professional Engineer) and R.H. (Registered Pharmacist).

Over the years, professional and technical associations have created what many consider to be a surfeit of certifications and designations. Most are understood and have meaning only among those practicing in the specific field to which the certification/designation applies. This is not to denigrate highly specialized certifications and designations, as for the most part they are *intended* to be known primarily within closely related professional and technical fields. Within those circles, they may provide a ready recognition of superior qualifications in a particular field of specialization – just as intended.

How are Certification Examinations Developed?

At professional and advanced levels, certification generally entails extensive education or experience requirements, or a combination of these, as well as an examination covering the body of knowledge of the certification area. Most credible programs also have requirements for continuing education and re-certification on a specified schedule, usually two or three years. Another common feature of reputable certifications is that the examination is based on sound psychometric testing methodologies, and are updated as dictated by developments in the field. Certification programs lacking these features additionally open themselves to potentially serious legal problems.

Designing, writing, and validating examinations for professional certification is difficult, lengthy, and expensive. For example, when National Environmental Training Association (NETA) members determined a need for certification many years ago, it still took several years of deliberation and planning before the decision was made to proceed. At that time, panels of specialists in each of the original exam technical areas met, developed the task analyses and core need-to-know contents (including the prioritization and relative weighting of the need-to-know items) under the direction of a specialist from Purdue University. With the information developed in these sessions, technical specialists in each area began developing test items, which were then further examined and validated by panels to determine relative levels of difficulty. This process requires a consensus to determine the percent of minimally competent trainers who are likely to choose the correct answer. Each test item is then coded to reflect all the relevant information about it.

Next, items are examined by a testing specialist to determine if question or detractor wording is unnecessarily obscure, potentially confusing, or in some way outright discriminatory. Items that pass this step (several revisions may be involved) are entered into the field test "item bank" and coded for the next step. Items are then field tested to acquire statistical and psychometric validity information on each question. In an *existing* subject area, this often is done as a part of an actual examination, by adding several field test questions to the exam. This is the quickest and easiest way to gather statistical data. *New* test areas, on the other hand, must be field tested in a discrete test. Since field test items often are still "raw," examinees may spot them as "peculiar" or seemingly redundant. Field test items are not figured into the score. Field-tested items that prove to be psychometrically and statistically valid are then recoded and included in the item bank for selection by the computer program which "writes" the test, according to criteria set for a given exam.

This entire process is highly specialized and can be very complicated. It requires a great deal of time to complete, as well as the specialized and expensive services of testing professionals. Unless the certifying authority can hire such personnel full time, they must contract with a professional testing service or testing specialists to do the psychometric and statistical work, as well as directing the test item writing and analysis.

Finally, certifying authorities generally agree that the underlying task analysis and need-to-know for each item bank in a test needs be reevaluated every few years. This is particularly necessary in rapidly developing specialty areas. Reevaluation involves reassembling panels of specialists periodically to determine current tasks, need-to-know criteria, etc. This process takes a great deal of money, as well as time and effort by many volunteers most of whom should be subject area rather than training specialists.

How are Certification Programs Administered?

Voluntary certification programs generally are managed and administered by professional or educational associations, societies, or directly associated foundations. This can lead to a potential conflict of interest between the objectives of the parent organization, and the objectives of the certification.

Most associations offering certifications also have as a part of their income stream courses to help individuals prepare for the certification, continuing education courses to help them retain certification, or both. These programs can be extremely valuable to the associations, their members, and those certified by them. Extreme care must be taken, however, that the income objectives of the association do not contaminate the integrity of the certification and its examinations. Some associations have dealt with this issue by creating separate, but related foundations or sister organizations to administer the actual certification, thereby presumably leaving the association itself "clean" to pursue its supporting education programs.

While this separation often makes sense for *trade* associations (which can gain tax benefits from having a separate educational foundation), most thinking today does not support the necessity of a separate entity to administer certification programs of educational (i.e, IRC 501(c)(3)) associations, so long as proper care is taken not to contaminate the process. On the other hand, having an independent *governing body* within the association to manage policy and procedures relating to certification *is* generally advisable. Experience has shown that such independent bodies tend to guard rather jealously the integrity of their programs.

The Problems...?

The most frequently encountered certification "malpractice" is the conduct of training by an association (or, sanctioned by an association) designed specifically to prepare people for their own examination. This is known as "teaching to" the examination and is, unfortunately, all too common. Can you imagine our most prestigious national testing organization, the Educational Testing Service in Princeton, running its own "cram" courses to prepare students for their college entrance or other examinations? Individuals or organizations evaluating certification programs for adoption or personal use should be aware of this danger, and look carefully at any training conducted by the association to assure that the integrity of the certification is not violated through easy access using this route.

On the other hand, since certifications are intended to convey an assurance that the certified individual possesses broadly based knowledge (and hopefully, resulting competency) in the field, training and education programs which teach the broad substance of the certification area should be welcomed, regardless of who offers the courses. Responsible testing authorities make the point that certification can, and should, validate the training or education the individual has received. The reverse is equally true: good education or training should provide the broad knowledge needed to practice in the field, and this can be tested by the certification exam. Thus, a sound educational or training program which avoids "teaching to" its exam -- but rather covers the topic without concentrating on areas known to be included in the exam, is an asset to the profession and strengthens its certification.

This brings us back to potential legal problems, mentioned earlier. Potential problems can result from either tortious interference of business relationships or for violations of antitrust laws. Although this is not intended to be legal advice, organizations interested in starting certification programs, or instituting new certifications, should take special care to assure that their programs are:

- accessible to everyone meeting minimum eligibility;
- administered with absolute fairness and without discrimination;
- have a written and fair appeals process;
- make no assurances of abilities or competencies beyond the minimum level for which it is designed; and
- not be tied to a requirement of membership in the granting organization.

Implicit in these requirements is that the examination itself be verifiably valid. This is the point of the exhaustive process outlined above for the development of certification examinations. No matter how scrupulously a program may be administered, if the exam itself does not reliably assess what it claims to, you have failed and thereby acquire potential liability. A single invalid or poorly constructed question or distractor (incorrect answers used in multiple choice questions) could cause an individual to appear to fail the exam. If that individual then had reason to believe he or she has been significantly damaged by the process, the certifying organization would be in for real trouble should the individual choose to sue.

- Charles L. "Rick" Richardson is Executive Director of the National Environmental Training Association, Phoenix, Arizona

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Notes for Production of Implementation Guide: Orlando Meeting and Outline

The following pages include notes from the latest Advisory Committee Meeting held on January 29 and 30, 1996, in Orlando, Florida; and a draft of an outline for the implementation guide.

Meeting Notes: An Open Discussion Regarding Implementation of the HAZMAT Skills Standard

To successfully implement the skills standard into industry practices and educational programs, more information is needed. CORD is conducting several workshops for the purpose of gathering information and developing an Implementation Guide. This guide will answer questions regarding competency levels, better definition of the skills standard, overlapping of skills within environmental technology, evaluating individuals, and assessing skill attainment.

The group broke into concurrent work sessions. Each session dealt with one of the following topics:

- **Hazardous Management Material Know-How**
  This work session used a three-dimensional chart to identify more detail within the skills standard. Each skill was considered within the contexts of the need for supervision, parameters within to make decisions, and situational settings of skills. This exercise generated a great deal of discussion. It was the consensus of the group that the level of supervision will vary greatly among organizations. It was concluded that students should be taught so that they can perform the standard without "direct supervision", but recognize that most organizations will provide entry-level technicians with supervision. This worksheet will be changed to a two dimensional worksheet and will be presented in the remaining workshops. This document may be included in the Implementation Guide as an instrument for evaluating employees.

- **Integrating Skills Standards with Scenarios**
  To illustrate a context which the skills are used in the workplace, scenarios can be useful. Common scenarios were developed for each of the thirteen job functions. These scenarios were made to be general in workplace situations so that they are applicable to many different working environments. We discussed the importance of problem-solving skills needed in the workplace. Often times how an individual trouble-shoots an unexpected problem reveals the level of competency acquired in a particular area. Since it is critical that the academic, employability, and

supporting knowledge all be integrated to achieve the intent of the skills standard, scenarios were developed to incorporate each of these.

- **Identifying common skills within environmental technology**
  Education programs are most often built around a cluster of occupations or area of study. Most programs involving Hazardous Material Management also encompass other environmental technology fields of study. For program developers to utilize the HMMT Skills Standard it is important to identify the commonality of skills across the environmental occupations. To assist in gathering this information a worksheet was used in working sessions to identify if each of the skills outlined in the standard are used in other environmental occupations. Nine general occupations were identified and analyzed. We have gathered this information in two other workshops and it will be used in the future HMMT workshops. Preliminary results indicate a close correlation of needed skills between a Health and Safety Technician and the HMMT. Other areas to consider include air quality, water quality, solid waste management, and planning technicians. It became apparent that many skills are used in other occupations, but perhaps in a different context. Further evaluation of identifying this information is important to assist in defining environmental technology as a whole.

On Tuesday, January 30, each of these work sessions involved all members. The results of these working sessions will be compiled and they will form the basis for future workshops. A consolidation of the information gathered is expected by February 19, 1996. This information will be used in the Implementation Guide. A draft form of the Implementation Guide will be available for committee member comments in April. The following people volunteered to assist in gathering information and writing parts of the Guide.

Rick Richardson	A model accreditation program
Reggie Moore	A model certification program
Bruce Rodgers Doug Feil	ISO 14000; The change from reactive to proactive emphasis in the technicians job.
Bob Bear	Industry survey
Jean Drevdahl	Gap analysis between school and industry surveys
Lois George	Identifying teacher resources and materials
Lois George	Internet Resources

Doug Feil Rick Richardson	
Gayle Haecker	Scenarios Career Paths Using the standard for developing job descriptions Identifying appropriate assessment techniques.

Outline for Implementation Guide

I. Overview
  - Project Development
    - Educate America Goals 2000
    - Department of Education Skills Standard Projects 25.
    - National scope of skills standards
    - The HMMT Skills standard project [illegible]
      - Advisory committee
      - Methodology of compiling skills standard
      - Validation of skills standard
  - Purpose of this document
    - Implementation into industry
      - Employee evaluation to the skills standard
      - Incorporating skills standards into training programs
      - Communicating industry needs to contract trainers
    - Implementation into education
      - Using the skills standard in Environmental Technology programs
      - Commonality of skills and career paths within Environmental Technology.
      - 2+2+2 Program in Environmental Technology
      - Assessing skill attainment in students
      - Models of accreditation and certification programs

II. Introduction - Skills Standards, Defining the Standard for Tomorrow
  - Define "standard" — process —
  - Explain academic, occupational and employability standards
  - Define what is needed for successful implementation by educators and industry members
    - *This should outline the remainder of the addendum. What is needed to integrat s.s. into curriculum, career pathways in developing programs, assessment of skill attainment, evaluating employees and training programs, etc.*

III. The World of Environmental Technology
  - Define "Environmental Technology"
  - Define "career ladder(s)"
  - Define Environmental Technician
    - *This professionalism and what is needed for high performance should will set the need for integrated skill standards.*

IV. Integrated Skills Standards for HMMT
  - Use scenarios to integrate skills standards

Implementation case studies

Include assessment methods in the scenarios, along with the defined skills standard, employability skills, and supporting skills, knowledge, and attributes

V. The Future of HMMT

What every employee will need to know.
Job projections
ISO 14000
Pollution prevention and a pro-active approach to environmental issues.

VI. Accreditation and Certification of HMMT programs and graduates

Outline the model suggested by NETA/PETE/CORD for accrediting programs
Outline currect certification programs (individuals) and cross reference to the standard --where information is available (i.e. NEHA)

Appendices

Validation process and results
Assessment methods of mastery matrix
Resources for Environmental Technology
Industry and employee evaluation tool(s)
Current certification processes
Bibliography

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24. HAZMAT Advisory Committee Meetings: Phase One (binder)
25. HAZMAT Advisory Committee Meetings: Phase Two (binder)
26. Subcontracts (folder)
27. Curriculum Development (folder)
28. TSTI-CORD (folder)
29. Articles (folder)
30. Correspondence (folder)

CONTENT MODEL

I. Worker Attributes

This section includes a series of descriptor categories related to the characteristics or qualifications that a worker brings to a job. The first five descriptors listed represent an approximate hierarchy or continuum of skills-related information (moving from general to increasingly specific levels of description and analysis) that is expected to provide a wide range of application options for users requiring skills information of different types and at different levels of specificity. It is expected that appropriate verification, elaboration and specification of these descriptor categories and their specific component elements will require further research.

Aptitudes and Abilities. The capacity to perform particular classes or categories of mental and physical functions; examples include: cognitive abilities (examples include: verbal, quantitative, abstract reasoning), spatial/perceptual abilities (examples include: spatial orientation and visualization, perceptual speed, flexibility and speed of closure), psychomotor abilities (examples include: arm, manual, and finger dexterity, eye-hand coordination), sensory abilities (examples include: vision, hearing, color discrimination) and physical abilities (examples include: static strength, dynamic strength, stamina, extent flexibility).

Workplace Basic Skills. Fundamental developed abilities that are required to at least some degree in virtually all jobs. Examples include: reading, writing and arithmetic or computational abilities. (These are included as a separate descriptor category because, although related to aptitudes and abilities, they include significant knowledge and learning components.)

Cross-Functional Skills. The various types of developed generic skills that are related to the performance of broad categories of work activity that tend to occur across relatively wide ranges of jobs. Examples include: information gathering, oral communication, problem analysis, negotiating, organizing and planning, coordinating with others and coaching or mentoring.

Occupation-Specific Skills. The developed ability to perform given general or specific work activities that tend to occur across relatively narrower ranges of jobs and/or are defined in relatively job or activity specific terms; these are operationally defined as the ability to perform the generalized work activities and job duties/tasks, defined in Section III, or the ability to use or operate given machines, tools, or equipment, defined in Section II. Examples include: ability to read blueprints, ability to repair electrical appliances, ability to type and proofread statistical reports, ability to operate a milling machine and ability to operate a forklift.

Occupation-Specific Knowledge. Understanding or awareness of, or familiarity with, the facts, principles, processes, methods, or techniques related to a particular subject area, discipline, trade, science, or art. Includes knowledge of foreign languages, computer programming languages and specific computer software packages or applications. Examples include: financial planning and analysis, fire protection systems, computer graphics, data communication networks, patent law, Spanish, COBOL and spreadsheet software.

Personal Qualities. An individual's characteristic, habitual, or typical manner of thinking, feeling, behaving, or responding with respect to oneself, others, situations, or events. Examples include: self-esteem, sociability, responsibility and integrity/honesty.

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Getting to Clusters
A Proposal to the National Skill Standards Board

Marc Tucker, President
National Center on Education and the Economy
September 1995

For almost twenty five years, real wages have been declining in the United States. In recent times, our people have been getting poorer even as our firms have been getting richer. This is mainly because firms in other countries with much lower cost structures than ours now have access to the most advanced technologies and international sources of capital and can therefore produce shoes, shirts, television sets and home videotape recorders at prices with which we cannot compete, if we are competing with them on price.

But there is an alternative. We can compete on quality, customization and prompt response to changes in consumer tastes. The world will pay much higher prices for such things than for widely available products and services that differ only in their price. To compete on quality, however, requires us to reorganize the way work gets done. No firm can produce quality by relying on a workforce that is expected to leave its head at the factory gate and to work in a highly routinized way. To the contrary, quality production begins by asking the front-line workforce to do many of the things that, up to now, we have asked only managers and professionals to do, and, in fact, means asking that workforce to take major responsibility for the continuous improvement of products, services and processes by which products and services are produced. In this environment, the highly stable and narrow job descriptions of the front-line mass-production labor force are obsolete and counterproductive. All over the world, analysts recognize that economic success depends in part on workers whose job is constantly being redefined, who are expected to do each other's jobs and who must think and learn in constantly evolving ways in order to succeed.

The single greatest danger in creating a national system of occupational standards is to cast the old-style, narrow job descriptions into concrete in the form of industry standards in that mold. Better to have no occupational standards at all. The National Skill Standards Board needs to keep in mind constantly the purpose for which it was created. It is not to promote skill standards *per se*. It is not to make sure that every worker and every job is covered by the new standards as fast as possible. *It Is most definitely not to codify the demands of most jobs as they are now being performed.* The job of the National Skill Standards Board is to promote the growth of our economy and the spread of high wages among our workers by using skill standards to promote a steady increase in the proportion of our workers who have *the skills needed for work in high performance work organizations.* The question is how to do that.

Imagine that the United States develops a comprehensive qualifications -- *or* standards -- system with three levels or tiers in it.

At the top of this standards system, call it Tier III, are skill standards for *individual* jobs -- like that of a welder of specialty alloys, or oil field rigger, or the operator of a machine that performs

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lithographic functions in the semiconductor fabrication business -- and standards set by individual firms for the way work is to be done in that firm -- for example, the standards Boeing sets for the tolerances and failure rates in the construction of its new 777 airplanes.

At the next level of the standards system, Tier II, are skill standards for *groups or clusters of occupations requiring broadly similar skills.* Because these groupings each include many occupations -- there might be a grouping, say, for manufacturing technicians, encompassing a great variety of types of manufacturing jobs -- there might eventually be no more than thirty of these categories covering most of the front-line jobs in the nation. The actual standards for what one would have to know and be able to do in each category and how well one would have to be able to do it would not be defined by the old style of work in which one was expected to leave one's head at the factory gate, but by the requirements of high performance work organizations, in which one is expected to think and to contribute a lot to the values and improvement of the product or services. These would be standards for the future, not the past.

And then we get to Tier I. This would be a set of *standards for what everyone in the society ought to know and be able to do to be successful at work, as a citizen and as a family member.* These standards would be set at levels comparable to what high school students can do in those countries that now have the best performance in this world in the core subjects of the curriculum. They would call for deep understanding of the subjects studied as well as the capacity to apply that knowledge to complex real-world problems. And they would incorporate the generic skills required to succeed in high-performance work environments irrespective of the particular job one is doing — things like problem-solving ability, the capacity to learn quickly and the ability to work well with others in groups.

In this scheme of things, the National Skill Standards Board would concentrate its efforts on Tier II standards, standards for broad groups of jobs in the economy, jobs that share a core of common skill requirements.

And it would have another role in development and updating of the generic standards for the skills and knowledge needed to succeed in all high performance work organizations, irrespective of the job or skill cluster. These standards will be of great help to those Tier I standards and will be of equal value to organizations and firms developing and using Tier III standards, because the generic standards should also be included in those standards.

Why do it this way? To focus the development of skill and knowledge on a particular job in the current economic environment is to invite instant obsolescence. The trick is to establish a balance between the general and the specific -- to create a set of standards specific enough so that those who meet a standard can offer a set of skills that have great value to the employers who need them, but general enough so that those skills are broadly marketable in many firms and even among many industries. What does this mean for the process of establishing clusters?

Imagine that the Board begins by dividing the American economy into about a dozen segments of roughly equal size. There are a number of conceptual schemes produced by well-known economists that could be readily used for this purpose. Then the Board commissions an organization with the appropriate technical expertise to send out questionnaires to a structured sample of firms and organizations in each of the segments, making sure that large firms and small

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are represented, that each major industry subsector within the broad industry segment is represented, that there is good geographic representation, and so on. Respondents are asked to identify those firms of all sizes in their Industry segment that they look to as leading the industry in terms of their use of high performance work organization, reputation for quality products and services and overall competitiveness.

When this list is boiled down, the Board then invites the leadership of each of the firms that score highest on this list made by their peers to send one or two people from their firm to an extended work session to be organized by the Board. The people invited to this work session, to last perhaps two weeks, are asked to came to agreement among themselves on a beginning list of broad clusters that will serve as the starting point for the development of the standards system. These initial clusters will typically cut across industry groups, but will be defined in each case by a common set of skills and knowledge required to do the work.

Following the meeting, the initial definition of clusters will have to be further developed and validated in the field, and that part of the process will culminate in an adoption by the Board of the validated clusters.

Once this initial set of Tier II clusters has been identified by the field in this way and endorsed by the Board, industry groups will be invited to develop standards for their own industry based on these cross-cutting clusters. In this way, the nation can have its cake and eat it, too. The first step in the process -- building the clusters -- will go a long way to making sure that we are setting standards for the future, not the past. The second step in the process -- getting industry groups to set standards for their own industry by modifying the cluster specification to meet the needs of their own industry -- will make sure that industry groups own and will use the standards, without which the whole exercise is meaningless.

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Gayle Haecker

From: Gayle Haecker
To: Jim Johnson
Subject: HMMT Focus Group Workshop - Colorado
Date: Sunday, January 07, 1996 6:26PM

IN YOUR BOX....

Here is the attendee list and agenda.

Just in case there might be a situation where you told me something you want available at the workshop or some information to be included in the packets and I have forgotten it ---- please think through this workshop and make a list of things you expect to see. i.e. is there anything specific to your presentation that would be relevant?

Lorenza will be putting together packets Tuesday afternoon. Let me know if you have questions.

HMMT Focus Group Workshop
Front Range Community College
Westminster, Colorado
January 12, 1996

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AGENDA

HMMT Focus Group Workshop

Front Range Community College
January 12, 1996

8:30 **Welcome**
Richard Barth, Front Range Community College

8:40 **Overview of Workshop Goals & Open Discussion Introduction**
Gayle Bowles Haecker, CORD

9:30 **Industry's Perspective of Hazardous Material Management** Technology
Michael Witt, Roy F. Westin, Inc.

10:00 Break

10:15 **The Future of Hazardous Material Management Technology**
Fred Schafer, Kleinfelder, Inc.

11:00 **The Integrated System of Workforce Education**
Jim Johnson, CORD

12:00 **Lunch**

1:00 **Overview of each Breakout Session**
Gayle Bowles Haecker, CORD

1:30 **Break-out sessions**

- Environmental Technology Educational Pathways
  Lead by Jim Johnson, CORD
  This session will concentrate on defining the Environmental Technology field of study and the knowledge and skills needed for success. We will look at commonality of skills needed among a cluster of occupations within Environmental Technology and how to present these in education and training programs.
- Identifying Competency Levels for Technicians
  Lead by Richard Barth, Front Range Community College
  This session will identify the different competency levels achieved within different educational programs, such as certificate, associate degrees, and compliance courses.
- Assessment through Integrated Skills Standards
  Lead by Gayle Bowles Haecker, CORD
  This session will focus on authentic assessment and how integrated skills assessment can separate the novice from expert. Industrial scenarios will be developed for the HMMT Skills Standard to be used in curriculum development.
- Certification and the Skills Standard
  Lead by Reggie Moore, NEHA
  This session will look at how the Hazardous Substance Specialist Certification matches with the Skills Standard. Discussion will concentrate on what is needed for a valid certification of Hazardous Material Management Technicians.

2:30 Break

2:45 **Report-out Panel Discussion**
Leaders of Break-out Sessions

4:30 **Conclusion and Workshop Evaluation**

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At the end of the project, almost all advisory committee members had been involved in providing feedback or attending meetings.

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	Tampa Department of Sanitary Sewers
	Coe-Truman Technologies, Inc.
	Lakeshore Technical College

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205 Cambridge Drive		Longwood	FL	32779-5709	Bob
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PSC 557 Box 1286		FPO	AP	96379-1286	David
P.O. Box 640121		Kenner	LA	70064-0121	Jack
P.O. Box 13087		Austin	TX	78711-3087	Kristina
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One Church Street	Suite 200	Rockville	MD	20850-4129	Ed
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1290 North Avenue		Cleveland	WI	53015	Steve

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203/974-0800	203/974-1459
202/260-4527	202/260-8626
303/466-8811x259	303/466-1623
202/872-4388	202/872-8734
404/639-6068	404/639-6075
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201/827-9101	201/827-8893
503/629-0573 (h) 503/978-5628 (w)	
800/270-6882	
319/398-5678	319/398-1250
419/423-6827 x252	
205/752-5543	
904/751-4000	904/751-7320
704/327-7000	
303/771-0900	303/843-9365
(Japan)	
504/361-2699 office days 504/469-	
512/239-2562	512/239-2550
414/452-5569	
301/251-1900	
513/648-7336	513/648-7084
617/863-1863	617/863-9965
301/570-0426	
303/756-9090	303/691-9490
513/841-4543	513/841-4488
703/425-9858 (home) 703/569-8800	703/866-3205
509/372-9208	
806/354-6001	806/354-6096
513/569-7537	513/569-7276
817/867-3438x3384 800/792-8784	
602/956-6099	602/956-6399
509/837-5504	509/373-5027
813/824-6653	813/824-6411
503/967-8860	503/967-8834
203/974-0800	
202/966-1500	
409/827-5186	
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National Voluntary Skills Standard document and brochure

NATIONAL VOLUNTARY SKILLS STANDARD
HAZARDOUS MATERIALS
MANAGEMENT TECHNOLOGY

Center for Occupational
Research and Development
601 Lake Air Drive
P.O. Box 21689
Waco, Texas 76702-1689

*For further information,
contact James Johnson, Project Director
at 800-972-2766.*

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National Voluntary Skills Standard
Hazardous Materials Management Technology
Center for Occupational Research and Development
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188

NATIONAL VOLUNTARY SKILLS STANDARD

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY

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BEST COPY AVAILABLE

During the past decade, a phenomenal growth has occurred in the concern for the environment, resulting in a number of federal, state, and local regulations and restrictions, and leading to a growing number of employment opportunities. For the most part, these jobs have been filled by workers who have grown up with the industry, gaining needed skills through workshops, courses, and on-the-job training. As the regulations and procedures become standardized, specific education, training, and skills required for professionals and technicians in these fields are emerging.

PREPARING FOR THE FUTURE

The United States remains the only major industrialized nation without national standards that define the skills required for industrial occupations, especially in rapidly changing technical fields. Skills standard projects have been established by the U.S. government to provide information about the skills, education, and training needed to function in emerging technical fields. As industry's need for qualified, knowledgeable technicians has increased during the past decade, so has the opportunity for schools to develop appropriate programs.

Funded by the U.S. Department of Education with matching funds from industry, the Center for Occupational Research and Development (CORD) has developed a voluntary skills standard for technicians who handle hazardous materials and hazardous waste. Intended to guide educators in creating curricula to meet the demands of industry, the Hazardous Materials Management Technology (HMMT) standard will provide the basis for education and training programs that will ensure industry's access to appropriately trained technicians.

PROVIDING EMPLOYABILITY SKILLS

A skills standard must outline employability skills needed to succeed in the technical field represented. The standard includes the academic foundation required as well as the specific technical skills identified by employers. The standard also must address the broad competencies and capabilities identified in the Secretary's Commission on Achieving Necessary Skills (SCANS) report. These employability skills are the workplace know-how that defines effective job performance today.

RELATING A SKILLS STANDARD TO EDUCATIONAL PROGRAMS

A skills standard benefits both industry and education by providing a clearly recognizable educational target. Educational programs designed to prepare people with the skills identified in this national standard will enable students to qualify for employment across the country. While programs may vary according to local employment needs, geographical area, and the diverse backgrounds of individuals entering the program, the skills standard provides a clear foundation upon which to build a quality program.

INDUSTRY'S PARTICIPATION

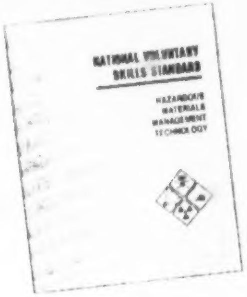
The National Voluntary Skills Standard for Hazardous Materials Management Technology was developed with the assistance of environmental technology experts representing over 100 businesses and industries and with the help of the following professional societies:

Hazardous Materials Control Resources Institute (HMCRI)
National Association of Environmental Professionals (NAEP)
National Environmental Health Association (NEHA)
National Environmental Training Association (NETA)
Partnership for Environmental Technology Education (PETE)

Developed under Grant No. V244B30010 from the U.S. Department of Education Business and Education Standards Program.

Please send me a complimentary copy of the

NATIONAL VOLUNTARY SKILLS STANDARD



HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY

Name
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School/Organization
Address
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State/Zip
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Briefly describe your involvement with HMMT:

A complimentary copy of the Skills Standard will be provided to individuals involved in Hazardous Materials Management Technology. (Limited quantities are available)

Please send me ____ additional copies of the HMMT Skills Standard at $18.50 per copy. (Item No. HM579-X) *Please add 8% for shipping and handling.*

☐ Check enclosed for $
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You may also order by faxing form to 817-772-8972. For more information, call CORD at 800-972-2766.

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CORD CENTER FOR OCCUPATIONAL RESEARCH AND DEVELOPMENT

FOR IMMEDIATE RELEASE
March 17, 1995

Contact: Teresa Rollins
(800) 972-2766

CORD RELEASES FIRST NATIONAL STANDARDS IN HAZARDOUS MATERIALS MANAGEMENT

WACO, TEXAS -- The United States remains the only major industrialized nation without national standards that define the skills required for industrial occupations. Skills standard projects have been established by the U.S. government to provide information about the skills, education and training workers need to function in emerging technical fields. The Center for Occupational Research and Development (CORD) has developed a voluntary skills standard for technicians who handle hazardous materials and hazardous waste.

During the past decade, there has been phenomenal growth in the concern for the environment, resulting in numerous federal, state and local regulations and restrictions, and leading to a number of employment opportunities. For the most part, these jobs have been filled by workers who have grown up with the industry. These workers gained needed skills through workshops, courses and on-the-job training. As the regulations and procedures become standardized, specific education, training and skills required for professionals and technicians in these fields are emerging.

According to *Peterson's Job Opps '94, The Environment*, the number of jobs in the environmental industry have steadily increased over the past few years. There were 793,159 environmental jobs in 1988, and in 1992, that number rose to 1,073,397. It is expected to reach 1,327,150 in 1997.

-MORE-

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"With the rise in the number of jobs in the environmental industry, it is imperative that we outline the skills necessary to succeed in this field," said Jim Johnson, project director of the Hazardous Materials Management Technology (HMMT) Project. "It is our hope at CORD that this skills standard will make a strong connection between the employment needs of business and industry and the educational institutions that prepare people for employment in the environmental industry."

The HMMT project, which is funded by the Department of Education, is one of 22 skills standard projects that has been coordinated by the Department of Labor and Department of Education. The hazardous materials standard defines what hazardous materials management technicians should know and be able to do to succeed on the job, and provides curriculum guidance to high schools, community colleges and universities that are creating or expanding hazardous materials management programs.

Thirteen job functions have been identified in the standard, along with the skills and knowledge necessary to successfully complete each job function. Also listed are specific skills related to chemistry, mathematics, physics, toxicology and computer technology that a Hazardous Materials Management Technology technician must possess.

The National Voluntary Skills Standard for Hazardous Materials Management Technology was developed with the assistance of environmental technology experts representing more than 100 businesses and industries, and with the help of the Hazardous Materials Control Resources Institute (HMCRI), the National Association of Environmental Professionals (NAEP), the National Environmental Health Association (NEHA), the National Environmental Training Association (NETA) and the Partnership for Environmental Technology Education (PETE).

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Newsletters

Skill Standards Report

VOLUME 1, NUMBER 1

SKILL STANDARDS REPORT

WHAT IS A SKILL STANDARD?

By Jim Johnson

Briefly stated, a skill standard is a list of skills, knowledge, and level of ability that a person must possess to be successful in a given occupation. There are as many ways of developing a skill standard as there are funded projects, but some common elements exist in all projects. A thorough definition of the occupation is essential. Typically included in the definition is a task list. This is not a simple list of activities but rather a description of the level of ability to which each task must be performed. For instance, if a photonics technician understands safety eyewear, does he/she simply use the eyewear provided for them or do they clean and store the eyewear, select those appropriate to the laser in use, test them for compliance, or design the eyewear for a given task?

An important component of the Clinton Administration's educational vision for the United States is the development of Occupational Skill Standards. As part of the initiative, **Goals 2000: Educate America**, twenty-two skill standards development projects have been funded. This is a joint effort of the Departments of Labor and Education. The Center for Occupational Research and Development (CORD) has received funding from the Department of Education for two of the projects—Photonics and Hazardous Materials Management Technology (HMMT).

The intent of *Skill Standards Report* is to communicate the progress of these and other skill standards projects and to share future plans and activities as the projects proceed.

After a comprehensive task list has been formulated, an analysis must be conducted to determine the skills and knowledge needed to successfully complete each task. Some skills may be very general in nature and applicable to a wide range of technologies, while others are very specific to a given occupation. Again, using the eyewear example, to understand the concept of optical density (OD) of protective filters, a photonics technician must know that an increase of 1 OD number (ie: from 3 to 4) increases the attenuation of the filter by a factor of 10 (from an optical attenuation of 1000 times to an attenuation of 10,000 times). A knowledge of exponents from mathematics is necessary to understand this concept. However, occupational skill standards would not attempt to define all the mathematical skills and knowledge involved with this concept.

MAKING THE TASK/SKILL LIST A "STANDARD"

Using the premise that standards are statements or policies that define a "norm" of expected outcomes, a skill standard must be recognized as the national norm for a particular occupation. Standards typically fall into two categories—regulatory or consensus. Regulatory standards are legislated into action and enforced by federal, state, or local authorities. Examples include the standards published by the EPA (Environmental Protection Agency) or OSHA (Occupational Safety and Health Administration). Skill standards are voluntary which means that they have become a standard by a consensus of opinion. The common ANSI (American National Standards Institute) standards are well-known examples of voluntary because they have been designed and agreed upon by committees of experts on the subject. Likewise, skill standards are voluntary standards designed by a coalition of experts. Both the Photonics project and the HMMT project have developed extensive coalitions of leaders from business, industry, government, professional societies, and education.

— story continued on next page

Inside:

Skill Standards Meet Tech Prep

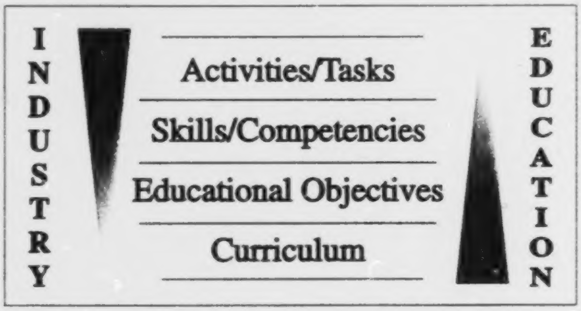
Task Collection Theory

Photonics & HMMT Updates

..."What is a Skill Standard?" continued

IMPACT OF SKILL STANDARDS ON INDUSTRY

Skill standards are intended to be industry led. Industry must define tasks and activities that employees are expected to perform. Educators participate in the process and help breakdown the tasks into skills and then take the lead in developing the educational objectives and training activities to instill these skills. The process and involvement of industry and education is illustrated below.



IMPACT OF SKILL STANDARDS ON EDUCATION

The current skill standards development program will define twenty-two different occupations from a national perspective. These standards can be used by schools as guidelines for implementing new training programs or evaluating existing programs. The standards will accelerate the design of new programs and curriculum, but schools must mold the national skill standards to the needs of local industry by forming local coalitions of experts. This has a secondary benefit because it will allow for improved communication between schools and local industry.

Uniform job descriptions benefit both industry and education by providing a clearly recognizable educational target. This is a double-edged sword because educational providers will be judged and held accountable to the standard.

SKILL STANDARDS MEET TECH PREP

NATIONAL TECH PREP NETWORK TO SHOWCASE PROJECTS AT SPRING CONFERENCE

By Julie Vitale

The most logical marriage of initiatives between education and industry is that of the Tech Prep/Associate Degree movement and the Industry Skill Standards projects. Both are federally-funded projects (Tech Prep funded through the Department of Education and Skill Standards funded through both the Departments of Education and Labor) with the purpose of better preparing students to enter the workforce.

Tech Prep/Associate Degree is a philosophy and a process of designing curriculum to connect secondary and postsecondary education levels as well as to integrate the academic and vocational skills and knowledge necessary to prepare for a career field. With this in mind, the skill standards projects add a much needed and critical component of a Tech Prep curriculum; the outcomes that a Tech Prep student must have upon exiting education and entering the workforce. Tech Prep educators are seeking advice, input, and involvement from businesses around the country and in various occupations to help them devise a logical sequence of courses that fully develop the skills industry requires now as well as in the future. Tech Prep graduates will be a new kind of employee; one that can continuously build their skills upon a foundation of solid math and science concepts.

The first step toward collaboration will be taken on April 10, at the National Tech Prep Network (NTPN) Conference in Baltimore. Project directors of various skill standards projects will conduct a pre-conference session to present the total scope and outcomes of their projects to Tech Prep educators. This gathering of education and industry representatives will initiate a dialogue between those who have a vested interest in skill standards and educational reform.

For more information on the NTPN Pre-Conference session, contact Jim Johnson at CORD, 800-972-2766.

Skill Standards Seminar
October 3 - 4, 1994
Roney Teaching Center
Waco, Texas

✓ ***AGENDA: Assisting Schools in Program Evaluation***

✓ ***PARTICIPANTS: Representatives from Industry and Education***

TASK COLLECTION THEORY: METHODOLOGIES AND LOGISTICS FOR THE PHOTONICS SKILL STANDARDS PROJECT

By Darrell Hull

Devising industry skill standards is a complex endeavor. The first and most important step toward standards development is taken when representatives from the designated industry are asked ***"What tasks must be accomplished by technicians in your field?"***

Because photonics and HMM are emerging technologies, the skill standards that will be developed through these projects must be as forward-looking as possible. The involvement of first line managers, engineers, or scientists that work directly with technicians is vital in this planning stage. Because these individuals are responsible for creating lasting improvements for photonics products or related services and are familiar with technician tasks and job requirements, they have a good sense of what the industry will face over the next five years.

Before industry representatives can respond to our question, we must first define the term "task." For the photonics skill standards project we will refer to tasks as assignments technicians must be able to accomplish on the job. Other skill standards projects may use a term such as objectives or competencies to describe what we call technician tasks. Regardless of the terminology, all skill standards projects will eventually link the needs of industry with the curriculum and training provided at educational institutions in order to provide technicians with the skills needed to be successful in their future jobs in industry.

To compile a comprehensive list of tasks, the industry representatives will be provided lists of tools and equipment along with action verbs that they will use to briefly state the tasks that technicians must perform. Industry committees, which will meet in June and July, will match action verbs with common tools or equipment. As task lists are gathered, the photonics project staff will organize the statements using Bloom's Taxonomy, a tool frequently used by educators, which will allow classification of tasks by the degree of cognitive processing required.

Once industry tasks have been defined for photonics technicians, committees of educators will be asked to translate those tasks into skills technicians must possess to be able to accomplish them. In a future issue of *Skill Standards Report*, we will focus on the translation of the tasks set forth by the photonics industry into skills developed by educators.

Category: Analysis, Test and Measurement

	Align	Select	Specify	Purchase	Fabricate	Mount	Install	Position	Rearrange	Repair	Refurbish	Integrate	Alter	Classify	Identify	Demonstrate	Operate	
Boxcar Averagers																		
Densitometers																		
Interferometers																		
Microdensitometers																		
Microscopes																		
Monochrometers																		
Optics Metrology Equipment																		
Power/Energy Meters																		
Radiometers/Photometers																		
Reflectometers																		
Spectroradiometers																		
Spectrum Analyzers																		
Time-Delay Generators																		

As Photonics task statements are gathered, they will be classified by degree of cognitive processing required to complete the task.

PhotonicsBEST Meeting

BUSINESS & EDUCATION STANDARDS FOR TECHNICIANS

July 23 in San Diego

- ***Photonics Engineers***
- ***Corporate Managers***
- ***Corporate Administrators***
- ***Photonics Technicians***

Visit our booth at CLEO in Anaheim

Jim Johnson

REPORT FROM THE DIRECTOR

PROJECT: HMMT

The HMMT project has established an advisory committee which met for the first time on December 3, 1993 and consists of 40 representatives from industry, labor, societies, education, and government agencies. Four groupings or specialities within HMMT were identified: Compliance, Remediation, Laboratory/Analytical, and STD (storage, transportation, and disposal). They are all expected to have a similar foundation of HMMT skills but possess enhanced skills in the speciality area.

Regional "focus" group meetings are being conducted to help identify local variations in HMMT requirements. The first one of its kind was held on February 23 at South Seattle Community College, and another was held in Miami on March 8. Additional meetings are being planned for Albuquerque, New Orleans, and Atlanta. The second advisory committee meeting is being planned for Fort Worth in June to coordinate with the annual meeting of the National Environmental Health Association. A survey is being prepared for distribution to several hundred potential employers of HMM technicians, with the results expected to be compiled and validated by the Advisory Committee later in the summer and eventually disseminated at the Skill Standards seminar in October.

Darrell Hull

REPORT FROM THE DIRECTOR

PROJECT: PHOTONICS

Considerable efforts are still underway to broaden CORD's list of industry relationships and contacts with significant representation from industry and education constituents on this project. The industry or business connection, we feel, must be exceptionally strong if we are to devise standards that are meaningful. Subsequently, the contingent from industry is taking time to assemble. If you have agreed to participate with us on the project or have nominated someone to participate and have yet to be contacted, please be patient, as we are attempting to put together complete committees and notify those individuals as soon as possible.

Our primary source of industry/business contacts is from the professional societies that already serve the photonics field, specifically, the SPIE (the International Society for Optical Engineering), the OSA (Optical Society of America) and the ASLMS (American Society for Laser Medicine and Surgery). Once we have received validated task lists from our industry/business participants, we will begin meeting with educators who can assist us in translating the associated skills. Meanwhile, if you have not been contacted to assist us on this project and you feel like you have something to contribute, call me at 800-972-2766, or email (darrellhull@delphi.com).

CORD
COMMUNICATIONS
P.O. Box 21206
Waco, Texas 76702-1206

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VOLUME 1, NUMBER 2

SKILL STANDARDS REPORT

THE NEED FOR SKILL STANDARDS

By Darrell Hull

In the earlier part of this century, the industrial system in the United States was second to none. Our industries flourished because of our economic strength, a proven approach to mass manufacturing, superior factories and equipment, and a workforce composed of strong managers and capable, compliant front-line workers. A college degree was considered a sure road to economic and professional success and the guarantee of a superior lifestyle that would improve each year. This concept became part of the American dream, and its perception has persisted into the present, even as the reality of the American job market has shifted.

Until the 1980s, our unskilled and semiskilled workers were competing indirectly with workers in third-world countries who could learn their jobs relatively quickly, achieve a comparable or superior level of quality, and remain satisfied with wages that were five to ten times lower than those of the American worker. The only way for American companies to compete globally and maintain operations within the United States was to make full use of information systems, sophisticated technology, and automation.

What are the keys to competitiveness in America for corporations that wish to compete on a global scale? Certainly their workforce plays a primary role. New workers in this country must be as capable and competent as their counterparts in other countries, or the U.S. will lose the heightening economic battle.

The intent of the *Skill Standards Report* is to communicate the progress of the Photonics and HMMT skill standards projects and to share future plans and activities as the projects proceed.

Fewer but higher-skilled workers were needed as a result. Delays in retooling and restaffing or "upskilling" resulted in loss of market share and loss of jobs. Something had to be done. The competence of students applying for jobs had to be addressed.

Nearly two-thirds of all students in public education do not complete a baccalaureate degree and are often perceived as students who cannot learn foundational subjects such as math and science. In fact, it is these students who in the future must be able to apply and transfer the same academic foundations even as the technology changes around them.

Community and technical college associate degree programs can play a role in preparing this large majority of students for the technical and academic skills they need in the workforce. Educational standards in an ideal school would include achievement that is measured by demonstrable skills and abilities. Employers not only would have a voice in setting the outcomes, but also would provide a kind of quality check on the educational process by their interest in hiring recent graduates of such a school.

In an effort to obtain consensus on the skills that should be imparted in educational institutions for these workers, the U.S. Departments of Education and Labor have funded 22 projects to identify and develop skill standards. A complete listing of the skills that should be taught would break down barriers such as different course names or numbers, and require schools to use a common language to describe what is taught. Translated, skill standards would provide a consistent base of skills which employers could use to evaluate potential employees.

Obviously, several iterations of employers and educators reviewing each other's work are required before the standard becomes a consensus document that students/workers, educators, employers, government, organized labor and others can rely upon to successfully link industry needs and education goals. This endeavor is what the 22 individual skill standards projects hope to accomplish.

Inside:
Constructing a Common Framework...
Certification Programs and Skill Standards

CONSTRUCTING A COMMON FRAMEWORK FOR SKILL STANDARDS PROJECTS

Before the National Skill Standards Board can function effectively, a set of criteria for endorsing standards must be developed. To build this common "framework," the Institute for Educational Leadership (IEL) has designed a process from which all project grantees should construct a skill standards model. Six commonly used models that meet the minimum necessary criteria for developing skill standards have been developed. These show that the skill standards:

- *must* communicate information to various audiences
- *must* allow for comparison of standards across occupational clusters
- *must* provide an avenue for implementation of certification activities such as assessment, recertification, and career mobility

Based on these criteria, any of the following six models as well as the Center for Occupational Research and Development (CORD) model for the Photonics Skill Standards Project could be acceptable standard forms for a skill standard. The first six models use APDOT categorization, and their advantages and disadvantages were developed by IEL. The final example demonstrates the model CORD has used in constructing the Photonics Skill Standards Project.

DEVELOPING AND EVALUATING MODELS FOR UNIFORMITY

MODEL A DESCRIPTION

The standard set is expressed as one or more statements of skill standards. Supporting evidence describing the requisite knowledge/skills and assessment is specified by standards set, but is not part of the standard.

Advantages

Standards statements can be written in any format and at any level of specificity. Each standard set is supported by descriptions of the requisite knowledge, skills, and assessments. Certification by standard set is possible.

Disadvantages

Descriptions may contain some duplicate information, since the same knowledge and skills could be required in more than one standard set. Having the same knowledge and skills apply to different standards sets may affect how assessments are constructed. Comparison of standards across and within occupational clusters may be limited if standards sets and supporting evidence are written at different levels of specificity.

MODEL A: SKILL STANDARDS SET + SUPPORTING EVIDENCE

Standards Set:

The worker calibrates equipment to produce a product within +/- .0001 degrees of specifications. Calibrations occur without assistance within two hours of blueprint review.

Supporting Evidence: *Knowledge/Skills*

- Can apply arithmetic calculations with 100% accuracy
- Has knowledge of basic manufacturing terminology
- Has knowledge of computer programming techniques for equipment calibration
- Has knowledge of algorithms to perform calculations
- Is able to develop a diagnostic computer program to obtain optimum equipment operations
- Is able to calculate equipment without assistance to produce within +/- .0001 degrees of blueprint specifications

Assessment:

- Assessments: a test of knowledge, a performance exercise, and a portfolio of 10 successful computerized manufacturing programs
- Assessments are given only by approved NWM programs.

MODEL B DESCRIPTION

The standard is a competency unit that includes the duty/function, tasks/activities, and performance criteria. The range specifies the circumstances under which performance criteria are applied.

Advantages

The competency unit, which as a whole represents the standard, is written in a specific grammatical format and at a predetermined level of specificity. This uniformity can enhance interpretation by different users. Certifications could be given by competency unit to permit horizontal as well as vertical career growth. Knowledge and skills must be integrated within the context of the work to be performed.

Disadvantages

A restricted format for writing standards limits the flexibility of the author. The parameters for assessment are established by the evidence of successful performance and the range indicators. This may restrict the way assessments are conducted. Using all performance criteria rather than sampling would be time-consuming if large numbers of individuals had to be assessed.

MODEL B: COMPETENCY UNITS

Duty/Function:

Calibration of manufacturing equipment to specifications

Tasks/Activities:

- Performs calculations to translate scaled drawings
- Interprets manufacturing specifications to determine requisite equipment calibrations
- Designs diagnostic programs to calibrate equipment

Evidence of Successful Performance:

- Applies appropriate mathematical calculations with 100% accuracy in translating scaled specifications to size
- Calibrates equipment that produces a product within +/- .0001 degrees of blueprint specifications
- Calibrates equipment within prescribed time frame

Range:

- Standard manufacturing specifications for metal products or electromagnetic wire
- XYZ computerized manufacturing system
- Manufacturing or recycling settings

MODEL C DESCRIPTION

Standards are expressed in terms of content and performance. To distinguish degrees of skill mastery, different performance standards can be established for the same content standard.

Advantages

Standards clearly differentiate what one needs to know or be able to do and the level at which competency is determined. Performance standards are clearly distinguishable from content standards. Performance standards can be used to differentiate vertical as well as horizontal career growth requirements. Content standards can be further clustered/organized by worker attributes (APDOT Content Model). A standard format for writing standards facilitates comparisons across and within occupational clusters.

Disadvantages

Every content standard must have one or more performance standard. Performance standards cannot relate to more than one content standard. Assessment strategies must be well conceived to avoid creating performance standards that are not practicable.

MODEL C: CONTENT- & PERFORMANCE-BASED STANDARDS

Content Standards:

Workplace Basic Skills: the worker knows basic mathematical calculations to compute density.

Occupational Knowledge: the worker knows manufacturing terms frequently used in product blueprint specifications.

Occupational Skills: the worker writes manufacturing programs using commonly accepted computer language.

Performance Standards:

Written Tests:

- The worker attains a passing score on the NWM written tests of basic skills.

Performance Exercises:

- The worker produces a widget within +/- .0001 degrees of specifications within two hours of review (entry level).
- The worker's portfolio demonstrates creation of operable computer programs written in 10 or more manufacturing setups (advanced level).

MODEL D DESCRIPTION

The standards module contains four components: technical skills, equipment/tools, basic skills, and range indicators.

Advantages

Certification of standards can be done by each component of a module (e.g., tools and equipment) or by module. Standards modules can differ by setting. Each component of the standards module can be written in any format.

Disadvantages

The module does not describe how the knowledge, skills, and equipment/tools are to be employed. Performance criteria are not stated. With no standard format for writing standards, comparisons across and within occupational clusters may be limited. Equipment and tools may become outdated more quickly than the technical and foundational skills.

MODEL D: SKILLS + TOOLS MODULE

Technical Skills:

- Has knowledge of basic manufacturing terminology
- Has knowledge of advanced programming techniques
- Is able to calibrate equipment to optimum standards
- Is able to calibrate equipment without assistance to produce the product within +/- .0001 degrees of specifications
- Is able to write manufacturing computer programs

Equipment and Tools:

- XYZ computerized manufacturing system
- Standard computer equipment

Foundation Skills:

- Has knowledge of algorithms to perform calculations for density
- Can apply arithmetic calculations with 100% accuracy
- Is able to read blueprint specifications
- Knows basic computer operations

Range:

- Manufacturing or recycling settings which specialize in metal or electromagnetic wire products
- XYZ computerized manufacturing system

MODEL E DESCRIPTION

This model contains both basic workplace skill standards and cross-functional skills. Each skill statement is a standard.

Advantages

Only basic skills and cross-functional skills are specified. Both content and performance standards can be established but are not required by the model. Standards for occupational clusters rather than single occupations can be established. Certification of competency can be based upon a set of basic workplace and cross-functional skills that are not occupationally specific. The certification entity would not need to be linked to a particular industry or occupation.

Disadvantages

Skill standards would not include occupationally specific standards. If standards are established across occupational clusters, validation to a specific occupation would still be necessary. Without a common format for expressing standards, comparisons across occupational clusters may be limited.

MODEL E: WORKPLACE BASICS & CROSS-FUNCTIONAL SKILLS

Workplace Basic Skills:

Content Standards:

- Has knowledge of arithmetic to perform calculations for density

Performance Standards:
- Can apply calculations with 100% accuracy

Cross-Functional Skills:

Content Standards:
- Able to read manufacturing blueprint specifications without assistance
- Knows computer programming

Performance Standards:
- Demonstrates 100% accuracy in interpreting five different blueprint specifications
- Creates 10 or more operable computer programs

MODEL F DESCRIPTION

Only occupationally specific standards are described. Each standard consists of a description of the knowledge, skills, duties/functions, and range.

Advantages

Only occupationally specific information (knowledge and skills as well as duties/functions) is provided in each standard. Standards are clearly linked to work duties/functions. Certification of occupational-specific standards can be performed separately from basic workplace skills or cross-functional skills. Certification by duty/function is also possible.

Disadvantages

Without a common format for expressing standards, comparisons across occupational clusters or with foundational skills may be difficult. Standards will not provide information about foundational skills such as basic and cross-functional skills. Occupational knowledge and skills required for one duty/function may also be required for others. This may cause duplicate information to be recorded in each standard. Performance criteria are not specified.

MODEL F: OCCUPATIONAL-SPECIFIC STANDARDS

Occupational Knowledge:
- Has knowledge of basic manufacturing terminology
- Has knowledge of advanced programming techniques for equipment calibration
- Has knowledge of computer programs commonly used in manufacturing

Occupational Skills:
- Is able to calibrate equipment to optimum standards
- Is able to calculate equipment with 100% accuracy
- Is able to write manufacturing computer programs
- Is able to develop diagnostic computer programs for equipment calibrations

Duties/Functions:
- Develops computerized diagnostic programs to calibrate optimum equipment efficiency
- Calibrates equipment to optimum operating standards
- Develops five-stage computerized manufacturing programs to meet customer blueprint specifications
- Knows basic computer operations

Range:
- Standard manufacturing specifications for metal products and electromagnetic wire
- XYZ computerized manufacturing system
- Manufacturing or recycling settings

CORD PHOTONICS MODEL DESCRIPTION

Standards are a collection of "tasks" and their associated "skills/competencies or knowledge components." Tasks are simple two-word statements, developed initially by a content expert. This is done by first listing the tools and equipment used by workers in the field and allowing members of the industry to connect these tools/equipment with verbs that indicate how the instrument is used. The tasks are validated and translated (again by educational content experts) into skills/competencies or knowledge components.

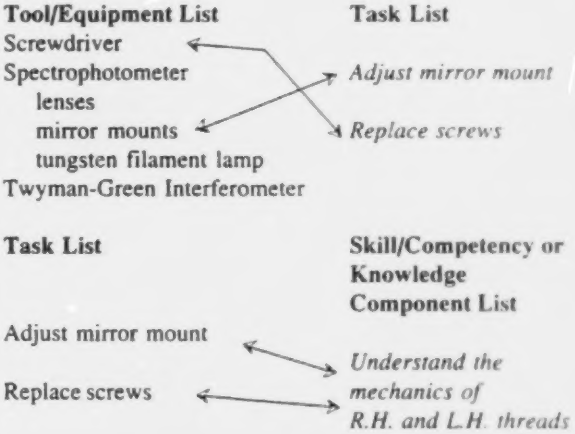
Advantages

Industry can easily provide a great deal of input into the standards. Industry and educators have clearly established roles, making it easier for them to participate in development. This understanding helps the project attract large numbers of coalition members from both sectors. Certification is tied to performance of the industry-specified tasks if necessary, creating an opportunity for applied, hands-on evaluation of competency. Simplicity and concrete terms should provide users with a workable standard, capable of being understood by educators, students, and employers, so that adoption is not a complex process. Curriculum development that is applied in nature is a straightforward endeavor using this output.

Disadvantages

Collection of the task data reveals many useless variables that would not be considered "real" tasks, but are evaluated regardless (i.e. clean software). This process would require adaptation for occupational categories that are nontechnical in nature.

MODEL



These models demonstrate only a few popular ideas for constructing standards. Many new formats continue to be proposed to industry and education. The design chosen for the NSSB must meet as many of the current industry needs as possible, yet remain flexible enough to change as new and better ways of presenting standards develop.

CERTIFICATION PROGRAMS AND SKILL STANDARDS

By Jim Johnson

A critical part of the 22 skill standards projects currently being developed is the identification of certification verifying that an individual has mastered the skills listed in the standard. The term "certification" may have different meanings depending on the technology or profession involved.

Often, "certification" is associated with management or professional levels of employment. The few certification programs that do exist for the technician are called "non-professional" or "sub-professional" certifications. Generally, they have little influence on employers. Virtually all certification programs require a candidate to have an educational degree, some related occupational experience, and a passing score on a competency test. Many certification programs also have a "code of ethics" that the certified individual accepts. The more rigorous the requirements, the more prestigious and respected the certification. These requirements do give an indication of an individual's qualification and work ethics, but they do not verify the mastery of any particular skill. Certification programs of this type need to be tied to the National Skill Standards so that the testing and assessment methods do, in fact, verify that the individual is proficient to the level of ability defined by the skill standard.

> ***Certification programs need to be tied to the National Skill Standards so that the testing and assessment methods verify that the individual is proficient to the level of ability defined by the skill standard.***

Most schools find it essential to be "accredited." Recognized accrediting agencies such as the Southern Association of Schools and Colleges (SASC) and the Accreditation Board for Engineering and Technology (ABET) have been setting standards for school operations and programs for many years. Recently, occupational groups and professional societies have been getting involved by setting guidelines that they expect training programs to follow. Automotive Service Excellence (ASE) and the National Automotive Technical Education Foundation (NATEF) have established a successful certification process for the automobile service industry. These guidelines outline the industry's expectations of training programs and address such issues as number of hours of training required, topics covered, tools and equipment used in the training, and instructor qualifications. The guidelines also define expected student performance. The certification program sets guidelines for the assessment of both the training facility and the students. The success of the program is primarily due to the fact that the employers are stakeholders in the educational process and recognize the practical value of the certification process.

To complicate things more, many states require licenses for certain technologies, such as health occupations. Other federal and state agencies also require certificates of training. In the field of Hazardous Materials Management, for example, the Occupational Safety and Health Administration (OSHA) requires special training for employees before they are "certified" to work with hazardous materials. Construction workers may need certifications from the state to work with lead and asbestos abatement.

Certification and the accompanying assessment of skills are a major part of the 22 National Skill Standards Projects and will be one of the top priorities of the newly established National Skill Standards Board. Certification provides another method for industry and professional leaders to be actively involved in the educational process.

WORKSITE LEARNING SPECIALTY CONFERENCE

following the National Tech Prep Network Annual Conference

October 30-31, Minneapolis

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Jim Johnson

REPORT FROM THE DIRECTOR

PROJECT: HMMT

Approximately 50 Hazardous Materials Management technicians (HMMT) contributed to an activity journal earlier this year by listing the job duties and responsibilities they encounter on a daily basis. These duties, along with information from various job descriptions, were grouped and organized into a Task Outline. This was presented to representatives of industry and education at three regional focus group meetings. The outline was also presented to the National HazMat Advisory Committee at a June meeting in Fort Worth, Texas. The comments and suggestions from attendees of these meetings are now being incorporated into the outline.

Staff at the National Environmental Health Association (NEHA) are using the outline to design an industrial survey. The survey will be sent to a large number of HMMTs and their employers. The results will validate the tasks and prioritize each task based on its importance and how often it is performed on the job.

A certification subcommittee has been formed and had its first meeting in July at the Roney Teaching Center in Waco, Texas, with the group investigating various certification programs and discussing possible methods of incorporating the skill standards into technician certification programs.

Darrell Hull

REPORT FROM THE DIRECTOR

PROJECT: PHOTONICS

Over 100 coalition members from the photonics industry completed task collection documents and discussed the development process for the project this past May in Anaheim, California. A second meeting, PhotonicsBEST, held this month in San Diego, was industry's final contribution to the initial phase of the project, giving coalition members from several professional organizations within the industry an opportunity to evaluate a compilation of all tasks provided to date.

Once the tasks for technicians have been analyzed, a meeting will be held in late August specifically for educators, who will begin the translation of tasks into skills. For example, industry will tell us the tasks workers should be able to perform in the workplace, such as "Align a Nd:YAG laser." The educators will then translate this task statement into skills that should be imparted in the educational institution. These might include the principle of reflection and the mechanics of mirror mounts, Q-switch operation, and so on. Educators will also be asked to develop a consensus opinion on the qualifications needed by educators to teach in this area. If you are interested in participating in the project or would like more information, you may contact me at CORD, 800-972-2766, or by E-mail (darrellhull@delphi.com).

HMMT DISSEMINATION WORKSHOP • OCTOBER 3–4, 1994 • CALL 800-972-2766 FOR MORE INFORMATION.

CORD
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Waco, Texas 76702-1206

***Skill Standards Report** is published by CORD Communications, an organization of the Center for Occupational Research and Development. The CORD organizations are dedicated to the advancement of technical education and contextual learning.*

VOLUME 2, NUMBER 1

SKILL STANDARDS REPORT

HAZMAT AND PHOTONICS SKILL STANDARDS PROJECTS PUBLISHED

The Hazardous Materials Management Technology and Photonics skill standards projects have been reauthorized for an additional grant period that will extend the work of the projects to three years each. The skill standards documents represent the first version of what will be a long process of change and reissuance to address the requirements for workers in the areas of both HazMat and Photonics.

As both projects conclude the first phase of funding, the Center for Occupational Research and Development (CORD) is currently distributing the standards publications. Only after a document is printed and released can the standards be evaluated for clarity and construction, as well as applicability to curriculum development and implementation. Since all standards must be continually updated to include the latest industry and educational changes, individuals should contact the project directors at CORD to make suggestions or voice concerns.

The photonics skills standard will be available for $18.50 from CORD Communications by calling 800-231-3015. All proceeds will be applied toward the printing, postage, and handling of the document. Should revenue from the sale of the skills standard document exceed production and handling costs, the excess money will be applied to accomplishing project objectives and funding of future iterations of the Photonics standard.

To order a copy of the skills standard publication for either HazMat or Photonics, contact CORD Communications toll-free at 800-231-3015. To receive a complimentary copy of the HazMat publication, call CORD at 800-972-2766.

The intent of *Skill Standards Report* is to communicate the progress of the HazMat and Photonics skill standards projects and to share future plans and activities as the projects proceed.

The photonics skills standard is also available on Internet's World Wide Web server at no charge. Internet: http://www.spie.org photonics_ed.html

The skills standard for HazMat is available without charge (on a single-copy basis) to qualified recipients. To receive your free copy of the publication, call CORD at 800-972-2766. You will be asked to complete a brief survey about your involvement in the field of HazMat. Multiple copies will be available for $18.50 each and can be ordered from CORD Communications by calling 800-231-3015. The standard will be available April 15 on the Internet. Internet: http://www.cord.org/~HMMT

CAREER CLUSTERS PROJECT

CORD is embarking on a new project under the guidance of the fifty State Directors of Vocational and Technical Education to design a career-cluster educational structure and a process for developing integrated curriculum clusters. Among other objectives, this project will attempt to identify foundations for learning similar to those outlined in the Photonics and HazMat standards. These foundations would be appropriate for clusters of occupations such as those with a Bio/Chemical core or foundation (including the HazMat project) or those with an Electro-Mechanical core (including the Photonics project). Now that the two skill standards documents are being released in print, as are other skill standards documents, it will be possible to analyze the standards to determine their commonality. If needed, this analysis could result in changes to the standards that would enhance their core or foundational elements in relation to other standards within the cluster of occupations.

This career-cluster structure should prove useful to high school students and educators alike in the construction of programs that articulate well within a Tech Prep (4+2) program of study. A solid Tech Prep program requires coordination between secondary and postsecondary institutions to give students a solid foundation for a career pathway and the world of work. A prospectus containing information about this collaborative project is available by calling Terri Johnson at 800-972-2766.

Inside:

- ***Using Skill Standards for Curriculum Design***
- ***Second Phase Funding for Skill Standards***

BEST COPY AVAILABLE

SKILL STANDARDS PROJECTS RECEIVE SECOND PHASE FUNDING

By Jim Johnson and April Watkins

The Hazardous Materials Management Technology and the Photonics Technician Skills Standard Projects both passed the half-way mark on November 1, 1994. Phase 1 is completed and Phase 2 has begun. Building on the accomplishments of the first 18 months, it is now time to lay plans for the remaining 18 months.

Now that the standards are published, why is Phase 2 needed? Because occupational skill standards are a new concept in the United States, businesses and industries are not accustomed to using such guidelines. Even in many educational circles, the design of educational programs consistent with national norms is a new approach to curriculum development. Project activities in Phase 2 will concentrate on issues such as the validation, dissemination, certification, and integration of the skill standards. We will attempt to reach an ever-expanding number of businesses and educational organizations to assist them in implementing the standards as an employment guideline and educational resource. The Internet offers a new tool for reaching a large audience. Not only will this allow greater access to and publicity of the standards, the Internet also gives interested parties an opportunity to make comments and suggestions concerning the projects. Hazardous Materials Management Technology and Photonics can only benefit from this input.

In Phase 2, HazMat project teams will also work closely with educators to design training programs consistent with the standard. Two types of educational programs are needed in this technology. The first program will include short-term courses designed to meet compliance requirements or to retrain employees whose jobs have been disrupted by economic forces such as military base closures. The second program is aimed at the education of students who will choose this occupation to begin their careers. Photonics teams will work to develop an integrated curriculum structure that accounts for academic standards, SCANS skills, and other workplace experiences. To be successful in these efforts for both standards, we must investigate integrated curriculum structures that guide individuals in their chosen career paths.

A final goal of Phase 2 is assessment and certification. The project staff along with various committees comprised of business and education representatives must define the requirements by which individuals can be assessed for certification based on the requirements of the standards.

HAZMAT SKILLS STANDARD DISSEMINATION WORKSHOPS SET

The HazMat dissemination workshop seminars are intended to help educators understand the significance of skill standards in developing technical curricula. The seminars are provided as a part of the U.S. Department of Education's Skill Standards initiative. A portion of each seminar has been designed to help participants understand the elements necessary to start or evaluate Hazardous Materials Management Technician (HMMT) programs in their institutions.

Where do you, the educator, come into the picture? This HazMat Skills Standard should be the basis for educational goals that determine the curriculum, that teach the skills, and that produce the students who can demonstrate the competencies outlined in the standard and perform as HMMTs in industry. It is in this last phase that you, as an educator, are the critical element. Each seminar will introduce you to the skills standard, and provide you the opportunity to reflect on how the standard can be turned into educational goals for your institution.

HAZMAT
SKILL STANDARDS
DISSEMINATION WORKSHOP

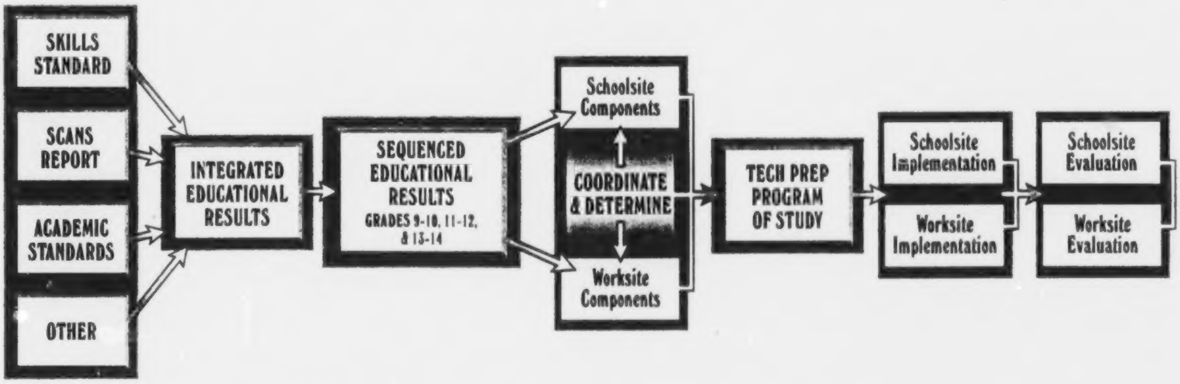
APRIL 27-28, 1995
Environmental Occupations Center
University of Florida
Gainesville, Florida

JUNE 14, 1995
in conjunction with the meeting of
The National Association of
Environmental Professionals
Washington D.C.

RELATING SKILL STANDARDS TO EDUCATIONAL PROGRAMS

By Jim Johnson

When developing an educational program for HMMTs, the curriculum developer must implement a planning procedure, such as the one outlined, before courses or text materials are chosen. The following illustration shows multistep procedures that are described below.


SKILLS STANDARD
SCANS REPORT
ACADEMIC STANDARDS
OTHER
INTEGRATED EDUCATIONAL RESULTS
SEQUENCED EDUCATIONAL RESULTS GRADES 9-10, 11-12, & 13-14
Schoolsite Components
COORDINATE & DETERMINE
Worksite Components
TECH PREP PROGRAM OF STUDY
Schoolsite Implementation
Worksite Implementation
Schoolsite Evaluation
Worksite Evaluation

Step 1: Identify all the standards that must be used to define an Integrated Educational Result. Skill standards identify occupational requirements, while other standards specify additional requirements. For instance, the National Council of Teachers of Mathematics (NCTM) has established a standard for secondary-level mathematics courses. The SCANS report, published by the United States Department of Labor, identified skills that should be addressed at all levels of education. Collectively, these standards and skills must be incorporated into an HMMT educational program. Integrating these standards in terms of educational results is the second step in the process.

Step 2: Integrate concepts from various disciplines across the curriculum.

Step 3: Look at the sequence and level of skill developments identified. Decisions about the grade level or student-development level most appropriate for the introduction of the various skills, competencies, and standards can then be made.

Hands-on educational activities are encouraged in a Hazardous Materials Management Technology program. Recently, issues related to school-to-work transitions and worksite learning have added dimensions not formerly addressed in most curriculum designs. Although assumptions can and have been made about the ways in which worksite learning can be accomplished, planning has rarely focused on expected results or methods of evaluating those results.

Step 4: Justify the need to move to a worksite learning activity rather than a schoolsite activity. Many of the skills represented by the standard and by SCANS information can be acquired in a classroom, laboratory, or simulated work environment. However, certain skills may be best addressed at a worksite, in an on-the-job environment. This determination must be based on sound reason and closely coordinated with the schoolsite curriculum. Many of the skills defined in the HazMat standard can be integrated into secondary-level training programs that articulate with postsecondary programs.

Step 5: Therefore, a Tech Prep program is strongly recommended for the preparation of HMMTs since it places emphasis on a curriculum that progresses from the secondary through the postsecondary level, and to employment. In addition, Tech Prep places very high importance on the "contextual" methods of learning that have proven successful for technician-level training.

Steps 6-7: As the curriculum is implemented, constant evaluation must be provided to verify that the requirements of the Standard are being met.

REPORT FROM THE DIRECTOR

PROJECT: HAZMAT

Jim Johnson

Over the next few months, Phase 2 activities will provide a variety of opportunities for discussion and review of the newly developed HazMat standard. I have listed project meetings, as well as conferences where project information will be presented. I hope to see you at one of the following:

- PETE–North Central; Cedar Rapids, Iowa; March 19-20
- ATE; Biloxi, Mississippi; March 24
- NTPN; St. Louis, Missouri; April 9-11
- AACC; Minneapolis, Minnesota; April 24-25
- HazMat Skills Standard Project Dissemination Workshop, TREEO Center; Gainesville, Florida; April 27-28
- PETE–Northwest; Portland, Oregon; May 5-6
- NTPN; Philadelphia, Pennsylvania; May 10-12

While some of these meetings only include individual presentations on HazMat, the dissemination workshop is a must for schools exploring programs in Environmental Technology. Each of these meetings require registration. For more information, contact me at CORD by calling 800-972-2766.

REPORT FROM THE DIRECTOR

PROJECT: PHOTONICS

Darrell Hull

At the close of 1994, the Photonics Technician Skills Standard Project Steering Committee met for two days in Waco, Texas at the CORD offices. This was a critical meeting since it determined the direction of the project as we head into 1995 and the final grant phase. Among other things, the committee approved a final version of the Photonics standard.

The committee also approved three very ambitious initiatives for the second phase of the project. First, it is the hope of the committee and project staff that the Photonics standard will live beyond the life of the grant. Therefore, additional input to keep the standard current and a means for doing that are both necessary. Second, a curriculum-design team is being formed to determine how the standard will be used in developing curricula for technicians. This effort will take into consideration a 4 + 2 model that relies heavily on a Tech Prep foundation. Third, a national certification process will be constructed to create a mechanism by which adherence to the standard is maintained.

As always, if you are interested in participating, or if you want to provide comments, you are encouraged to contact me at CORD by calling 800-972-2766. We welcome your input.

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Skill Standards Report is published by CORD Communications, an organization of the Center for Occupational Research and Development. The CORD organizations are dedicated to equipping all learners to succeed in the contemporary workplace.

Business/Industry Survey

This survey was used to collect information as to what businesses consider on importance of skills/knowledge for hazardous materials technicians (employed with company).

NATIONAL VOLUNTARY SKILLS STANDARD ANALYSIS
Hazardous Materials Management Technology

Please check the answer that best describes your opinion or current situation.

Please return the completed survey in envelope provided **by April 30, 1995.**

Name: ____________________

Title: ____________________

Company: ____________________

Address: ____________________

____

City/State/Zip: ____________________

Telephone: ____________________ **Fax:** ____________________

Check the box that most closely describes your company.

- ☐ Agriculture
- ☐ Mining
- ☐ Construction
- ☐ Transportation and Utilities
- ☐ Contracting Services
- ☐ Consulting Services
- ☐ Manufacturing
- ☐ Public Administration

1. Check the appropriate range for the approximate number of people employed by your company.

less than 25	25 - 100	101 - 250	251 - 1000	more than 1000
☐	☐	☐	☐	☐

2. Check the appropriate range for the number of hazardous materials technicians employed by your company.

one part-time	1 - 5	6 - 25	26 - 100	more than 100
☐	☐	☐	☐	☐

3. How large an area does your company cover?

Local	Statewide	Regional	National	International
☐	☐	☐	☐	☐

4. How many offices or facilities are within your company?

one	2 - 5	6 - 15	16 - 50	over 50
☐	☐	☐	☐	☐

5. How large is your area of responsibility?

Local	Statewide	Regional	National	International
☐	☐	☐	☐	☐

6. How many offices or facilities are in your area of responsibility?

one	2 - 5	6 - 15	16 - 50	over 50
☐	☐	☐	☐	☐

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NATIONAL VOLUNTARY SKILLS STANDARD ANALYSIS
Hazardous Materials Management Technology

The National Voluntary Skills Standard for Hazardous Materials Management Technology describes four areas of specialization for hazardous materials management technicians and the various tasks performed in each area. The areas of specialization are as follows:

- Laboratory/Analytical Technician (LAT): The primary area of specialization for this individual is the analysis and testing of chemical compounds in a laboratory setting. This person may complete tasks ranging from the initial preparation of samples for analytical testing to the operation of complex and highly sensitive instrumentation.

- Compliance/Regulations Technician (CRT): This individual's primary area of specialization and focus is interpreting and implementing regulations and ensuring industry compliance with the regulations. This person may complete tasks ranging from inspection to enforcement, to suggestions of statements to meet changing or new regulations.

- Field Operations/Remediation Technician (FORT): This person's primary area of specialization and focus is the practical aspects of working with hazardous materials in the field. This person may complete tasks ranging from the collection of samples, data, and information to the implementation of remedial and corrective actions.

- Treatment/Storage/Disposal Technician (TSDT): This individual's primary area of specialization and focus is in the methods and techniques for safe, effective, and efficient treatment, storage, and disposal of mixed materials and waste. This person may complete tasks ranging from the handling and transportation of hazardous materials and waste to the implementation of effective treatment and disposal methods.

7. Which one of these best describes the primary duties of your technicians?

☐ Laboratory/Analytical
☐ Compliance/Regulations
☐ Field Operations/Remediation
☐ Treatment/Storage/Disposal

NATIONAL VOLUNTARY SKILLS STANDARD ANALYSIS
Hazardous Materials Management Technology

Listed below are two scales accompanied by a skill standard statement. The Importance of Skill scale will be used to indicate how important industry considers the particular skill standard. The Frequency of Use scale will be used to indicate how often the skill is currently being used by technicians in the industry. Please read each skill standard statement and check one item on each scale that indicates the following:

1) How important you think it is for your company's hazardous materials technicians to be able to demonstrate the skill;
2) How often you think your hazardous materials technicians use the skill in their employment with your company.

Importance of Skill						Frequency of Use					
Not Important				Very Important		Daily	Weekly	Monthly	Quarterly	Yearly	Never
☐	☐	☐	☐	☐	Evaluate hazardous materials and hazardous waste sample data	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Safely handle hazardous materials and hazardous waste	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Respond to hazardous materials and hazardous waste emergency situations in accordance with regulatory requirements	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Operate equipment related to hazardous materials and hazardous waste operations	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Identify and label hazardous materials and hazardous waste in accordance with regulatory requirements	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Calibrate, operate, and maintain instrumentation	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Compile, record, and maintain required documents for hazardous materials and hazardous waste management activities	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Implement procedures to comply with appropriate regulations	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Implement applicable safety regulations and procedures	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Select and use appropriate personal protective equipment and respiratory protection	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Collect, prepare, document, and ship samples for analysis	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Transport and store hazardous materials and hazardous waste in accordance with applicable regulations	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	Operate hazardous materials and hazardous waste treatment and disposal systems	☐	☐	☐	☐	☐	☐

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NATIONAL VOLUNTARY SKILLS STANDARD ANALYSIS
Hazardous Materials Management Technology

Listed below is an Importance of Skill scale accompanied by statements of basic skills. The scale will be used to indicate how important industry considers the particular basic skill. Please read each basic skill statement and check one item on the scale that indicates how important you think it is for your company's hazardous materials technicians to possess the basic skill.

Not Important				Very Important	
☐	☐	☐	☐	☐	A hazardous materials technician must have a background in mathematics. This must include the completion of a secondary level mathematics curriculum, including algebra and geometry.
☐	☐	☐	☐	☐	A hazardous materials technician must have a background in science. This must include an understanding of the interrelationships between chemistry, toxicology, and biological systems.
☐	☐	☐	☐	☐	A hazardous materials technician must have a background in physics. This must include the ability to apply the concepts of physics to mechanical, thermal, electrical, and fluid systems.
☐	☐	☐	☐	☐	A hazardous materials technician must have a background in computer applications. This must include the use of hardware, word processors, spreadsheets, databases, and communications programs.
☐	☐	☐	☐	☐	A hazardous materials technician must be able to locate, understand, and interpret written information in prose and in documents such as manuals, graphs, and schedules.
☐	☐	☐	☐	☐	A hazardous materials technician must be able to communicate thoughts, ideas, information, and messages in writing.
☐	☐	☐	☐	☐	A hazardous materials technician must be able to apply statistical quality-control techniques to situations.
☐	☐	☐	☐	☐	A hazardous materials technician must be able to work and communicate as a member of a team.

The National Voluntary Skills Standard for Hazardous Materials Management Technology (HMMT) is a project developed under a grant from the U.S. Department of Education. The success of this project depends on the feedback and involvement of industry. Are you willing to participate in either of the following areas:

☐ Further evaluation of the HMMT National Voluntary Skills Standards
☐ As an advisor on this project

☐ Please send a copy of the *National Voluntary Skills Standard for Hazardous Material Management Technology.*

Thank you very much for your assistance in this project. We welcome your comments, so please contact us at any time.

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Articles

Though different from the usual news updates on emerging regulations or current events that are often featured in the Special Report column, this article presents important information on the development of a skills standard, one component of the Clinton administration's educational initiative, "Goals 2000: Educate America."

The Development of a Skills Standard for Hazardous Materials Management Technology Technicians

James Johnson and Robert L. Bear, P.E.

During the past decade we have witnessed a phenomenal growth in the concern for the environment. This growth, as a result of ever-increasing federal, state, and local regulations and restrictions, has led to the development of numerous employment opportunities. For the most part, the employment opportunities have been filled by professionals who have, for lack of a better term, grown up with the industry. However, in recent years, as the regulations and procedures have become more standardized and routine (and concern for the minimization of costs in a competitive marketplace have increased), many of the responsibilities undertaken by professionals have been transferred to technician-level personnel. This transition from professional to technician-level personnel has developed an opportunity for the education and training of individuals with specific skills and has caused the federal government to recognize the need for the development of measurable skills standards for these individuals.

The United States remains the only major industrialized nation that is without standards to define the skills required for industrial occupations. With few exceptions, our schools have been preparing people for vocations with only vague job descriptions to guide them. Schools can only guess at the demands of a particular occupation, as there is presently, in most cases, no nationally-based norm. For the most part, schools have made this guess with the help of a small number of localized industrial representatives. This has limited the effectiveness of schools in developing programs that meet the needs of industry beyond a specific, locally recognized need. It is little wonder that schools receive criticism for producing students who cannot function in an entry-level position without needing long periods of on-the-job training before they become productive employees. Additionally, as the needs of industry for qualified, knowledgeable technicians have increased during the past decade, the opportunities for schools to develop such programs have increased.

The current administration's educational initiative is designed to combat this and other educational problems. A multi-faceted program, "Goals 2000: Educate America" has as one of its top priorities the development of skills standards for certain key occupations. "Skills standards" define the knowledge, skills, attitudes, and level of ability necessary to successfully function in specific occupations. At this time, 22 different occupational skills standards development projects are in progress. In addition, other projects are underway that will eventually identify and standardize foundational skills for all occupations. These skills are identified in the Secretary's Commission on Achieving Necessary (SCANS) Skills report, published by the Department of Labor, relating to technical and interpersonal skills. Since occupational skills standards are a new concept in this country, there is no uniform format or developmental process for them.

Guidelines for the development of skills standards are generally accepted as follows: 1. Skills standards must be voluntary; 2. They must be industry based; 3. The occupation must be explored and defined in detail; 4. A coalition consisting of representatives from industry, business, and education must lead the development and validate the final result; 5. A list of tasks and associated skills must be disseminated, discussed, debated, and modified by experts in the field until a consensus is reached and the list is recognized as a standard.

The advantages of having skills standards include the following: 1. Employees will have a clear picture of what they have to be able to do to be successful in the occupation; 2. Training providers can be held more accountable, since a clear set of performance expectations will be outlined; 3. Skills standards will make U.S. businesses more competitive in the global marketplace, since workers will have an understanding and level of ability that will equip them to perform tasks successfully; 4. Educational institutions and curriculum developers will have a clearly defined target that industry has provided; 5. Less emphasis will be placed on a degree and more on job-related skills.

In recognition of the need for qualified entry-level personnel in this area, "Goals 2000: Educate America" includes the development of a standard of skills for Hazardous Materials Management Technology (HMMT) technicians. In the development of this standard, a national advisory committee has been assembled to guide the project. The committee, consisting of 49 representatives (including representatives of various regulatory agencies), provides several different viewpoints. The composition of the advisory committee is shown in Table 1.

This advisory committee has been commissioned by the federal

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Table 1. Hazardous Materials Management Technology Skills Standard Project.

National Advisory Committee Membership	
Industry	13
Consultant/Remediation	7
Municipal	2
Unions	3
Societies	6
Government	2
Military	3
Colleges (2- and 4-Year)	13

government with the task of answering fundamental questions, such as:

- Is an HMMT technician the person who responds to an emergency like a chemical spill or a fire? Or is that person a "firefighter" with some special skills?
- Does an HMMT technician work with short-term emergency response, with the clean-up or remediation of contaminated sites, or on long-term pollution prevention projects?
- Does an HMMT technician need to possess knowledge of chemical hazards only, or is a knowledge of nuclear and/or biological hazards also expected?
- How completely does an HMMT technician need to know the federal, state, and local environmental laws?
- Does an HMMT technician interpret regulations and apply them to a specific situation, or does the HMMT technician fill out and submit reports to various agencies?

Within the field of HMMT are different occupations that require different skills related to hazardous materials management. In some environmental occupations, an HMMT technician needs only a limited set of hazardous materials management skills, while in other occupations a much more rigorous set of skills is required. Indeed, some occupations may even require that an HMMT technician obtain specialized skills in related occupational areas such as safety and health, management, regulations, laboratory operations, remediation, and so on. This concept is illustrated in Figure 1, which begins by showing that all technicians need foundational skills related to communications, mathematics, science, logical reasoning, and interpersonal relations. As occupational skills are acquired, a person may be employable in some hazardous materials management occupations even though that person does not have all the skills required to become an HMMT technician.

The definition of an HMMT technician varies with the needs of the prospective employer. Since it is a subset of the more general category of Environmental Health and Science, it is instructive to explore some of the history of the development of this field.

Although employment in the environmental industry has begun to flatten out recently (1), in our opinion, the outlook still remains strong for opportunities in the field of Environmental Health and Science. Environmental engineering curricula at major colleges and universities across the United States used to be primarily a subsection of the civil engineering departments, providing a specialty in water-waste treatment and design (WWT/D). However, in the past several years, institutions of higher learning have begun to place the environmental engineering curricula on their own as stand-alone departments of environmental engineering. The need for environmental technicians has paralleled the need for environmental engineers.

Qualified HMMT technicians are still receiving training on the job. According to one study, on the whole, "technicians (this, although not identified as such, includes HMMT technicians) get more education and training in preparation for their jobs and upgrading once they are on the job than any other occupational group..." (2).

The authors of this paper have hired and trained four, nonprofessional HMMT technicians in the last four years. In each case, the resumes received for these positions were divided between those who were overqualified, with baccalaureate and master's degrees in engineering and geology and those who had no previous experience or education that would have qualified them prior to employment. The overqualified people were not considered, which meant that it became necessary to immediately send those hired to various seminars and training courses and to assist them in the field to provide them with the skills needed to perform their work.

HMMT Technician Defined

So, what is an HMMT technician, and how does this individual fit into the field of Environmental Health and Science? In differentiating technicians from technical professionals (that is to say, doctors, engineers, and scientists), Anthony Carnavale, et al., state:

> "Technicians include employees whose primary expertise lies in a particular technical specialty area. While technicians have a considerable depth of knowledge and highly developed skills in their areas of expertise, they generally lack the breadth of knowledge in the theoretical aspects of their specialties that is required of technical professionals. Although many technicians are graduates of four year colleges, many have developed their skills and knowledge through technical or vocational schools, community colleges, or on-the-job training. After technical and non-technical professionals, technicians are the most highly educated and well-trained employees in the American workforce."

Technicians usually receive training that applies directly to their jobs. This training has its basis in theory but is focused more directly

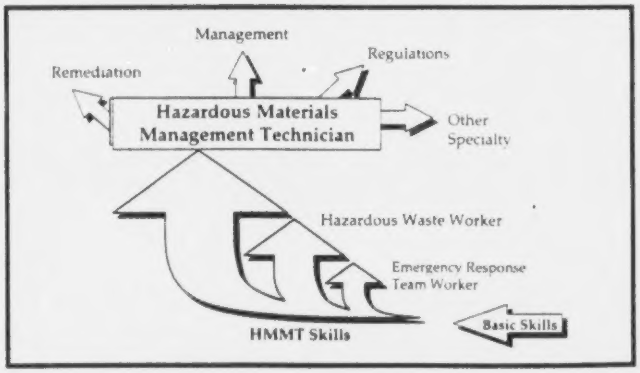

Figure 1. Hazardous Materials Management Occupations.

on the application of theory to the job than is training for technical professionals (3).

According to the *Dictionary of Occupational Titles*, HMMT technicians are individuals who: "...provide information and advice on ways to collect, transport, handle, store, and dispose of toxic wastes. They help monitor and direct the cleanup of land, water, and air. These technicians survey industries to learn what disposal methods they use. They look at hazardous waste treatment disposal from the standpoint of both effectiveness and cost. From their findings, they make recommendations for ways to collect, move, store, treat, and dispose of wastes. They offer advice and technical aid to members of industry and government" (4).

To help protect people and the environment, HMMT technicians, especially those who work for the state or federal government, draft rules and regulations for handling hazardous waste. They also help develop programs to prevent spills of hazardous waste. They review company or agency plans for spill prevention, and they suggest changes in those plans. They help develop regulations for the reporting of spills and for measuring environmental damage caused by those spills (5).

We submit that HMMT technicians are highly skilled and knowledgeable individuals who are trained to use technical applications of theory to specific tasks. As such, they may work with professionals who are trained in the understanding of theory to develop and implement tasks that relate to the field of Environmental Health and Science. This is not to say that HMMT technicians do not have an understanding of the theoretical concepts, only to imply that their experience and training is directed more toward the implementation of the theory than the actual concepts behind the practice itself. As such, HMMT technicians fall well within the field of Environmental Health and Science as a major, necessary, and highly employable subset.

Tasks Performed by HMMT Technicians

This project defines areas of specialization for HMMT technicians. The tasks performed can span a range of activities (6). Because of this multiplicity of tasks, to provide some parameters, the advisory committee has *arbitrarily* grouped the activities of an HMMT technician into the following four subsections: 1. Laboratory/Analytical Technicians (LAT): The primary area of specialty and focus for this individual is the analysis and testing of chemical compounds in a laboratory setting. The tasks this person may be required to undertake may range from the initial preparation of samples for analytical testing to the operation of complex and highly sensitive instrumentation; 2. Compliance/Regulations Technicians (CRT): This individual's primary area of specialty and focus is in the interpretation and implementation of regulations to ensure compliance of the same in industry. The tasks this person may be asked to undertake may range from inspection to enforcement, and to the writing of new regulations as needs arise and situations change; 3. Field Operations/Remediation Technicians (FORT): The FORT's primary area of specialty and focus is in the practical aspects of working with chemical, biological, and nuclear hazards and materials in the field. The tasks this person may be asked to undertake may range from the collection of samples, data, and information to the design and implementation of remedial and corrective actions; and 4. Transportation/Storage/Disposal Technicians (TSDT): This individual's primary area of specialty and focus is in the methods and techniques for safe, effective, and efficient treatment, storage, and disposal of chemical, biological, and nuclear materials and wastes. The tasks this person may be asked to undertake may range from the handling of hazardous materials and wastes to the design and implementation of effective treatment and disposal methods.

A Typical Day in the Life of an HMMT Technician

As previously stated, the tasks performed by an HMMT technician can span a wide range of activities. The above groupings have been arbitrarily formulated in an effort to provide some parameters for this assessment. Based on our experience in the field, we recognize that to attempt to finely divide the tasks performed into one category or another is impractical. These technicians are called upon by their employers to be multifaceted, and there is no such thing as a typical day in the life of any of the above-stated groupings of individuals.

However, borrowing from the approach described by Paula M. Hudis, et al., there do appear to be some broad ranges of activities under which the activities of our groupings for HMMT technicians may fall (7). In that light, we offer the matrix in Table 2 as an outline of the tasks they may be called upon to undertake in a typical day.

HMMT Specialties and Where Employment is Anticipated in the Environmental Industry

While the rate of employment in the environmental industry is flattening, in our opinion the outlook still remains strong for employment opportunities in the field of Environmental Health and Science. Susan Camardo, writing in *Peterson's Job Opps '94, The Environment*, states that the environmental industry "had been riding high in the mid to late 1980s, with growth estimated at anywhere from 16% to 30% per year. But about two years ago, the growth rate slowed dramatically, to 2.1% in 1991 and 3.9% in 1992. Grant Ferrier, editor of *The Environmental Business Journal*, predicts that the industry will remain flat throughout 1993, with an

Table 2. HMMT Specialities and Activities.

Activity	HMMT Technician LAT	CRT	FORT	TSDT
Remediation	•	•	••	••
Corrective Activities	•	••	•	•
Waste Treatment and Management	•	•	•	••
Source Minimization and Recycling	•	•		••
Disposal Activities	•	•	•	••
Monitoring Activities	•	•	••	•
Transportation Activities	•	•	•	••
Emergency Response Activities	•	•	••	•

•	Area of Specialization
••	Primary Area of Specialization

upturn starting in 1994. He doesn't see the environmental industry returning to its former double-digit growth levels but projects that growth over the next five years will average 5% to 7%" (8). Ms. Camardo offers several reasons for the slowdown of the environmental industry. These include: 1) the maturation of the industry, 2) the increase in competition, 3) a shakeout and consolidation of companies within the industry, and 4) the postponement of environmental spending by industry due to prevailing economic forces. However, she notes that a steady increase in the number of jobs in the environmental industry over the past several years has been charted by others. In 1988, there were 793,159 jobs. This number has risen to 1,073,397 as of 1992. The expectations are that the employment figure will rise further to 1,327,150 jobs in 1997.

Ms. Camardo indicates that the "industry segments that look particularly strong in the near term are:

- Environmental energy sources (solar, wind, geothermal, and other forms of alternative energy);
- Air pollution control (air quality management, equipment manufacturing);
- Resource recovery (post-con[illegible]er and post-industrial recyclers and scrap dealers, waste-to-energy plants);
- Waste management;
- Environmental testing and analysis; and
- Environmental consulting.

The most sluggish segment is expected to be asbestos abatement, due to continuing softness in commercial real estate sales, which historically account for a third of this segment's market."

In discussing the "Industry of Tomorrow," Ms. Camardo states: "Perhaps the most important trend experts see developing is a shift in the forces driving the environmental business. Up to now, growth has been fueled by corporate America's needs to comply with extensive and often complex environmental regulations... As a result, firms specializing in environmental cleanup, especially those in the waste management area, have made up the largest and strongest part of the industry. And the price tag for this cleanup has been tremendous.

But now, more and more attention is being focused on the other side of the environmental equation—prevention. Not only is this a necessary step to take in the preservation of the planet, but it also makes good business sense. Pollution prevention relies on using more efficient processes to reduce wastes while producing more product per unit of raw material...

Jeffery Leonard, president of the Global Environment Fund, L.P., which focuses on investments that promote environmental improvement, estimates that more than half of United States environmental spending by the year 2000 will spring from nonregulatory factors rather than anti-pollution laws. According to Michael Silverstein of Environmental Economics, 'The real action is going to be in avoiding environmental expenditures rather than making them.'

...One thing is certain—*whatever form they take, environmental jobs are here to stay* " (8). (Emphasis is ours.)

Potential Environmental Employers

Based on our observations and the sources we consulted for this paper, potential environmental employers appear to fall into two broad categories: those who provide environmental services and those who generate hazardous wastes and materials.

Environmental service "includes companies that provide private firms and government entities with environmental waste management, hazardous waste removal, and environmental management services as well as related laboratory and environmental equipment services. These firms reportedly represent a $132 billion business in the United States, employing about 814,000 workers" (9).

Those who generate hazardous wastes and materials include businesses and industries that "are rarely classified as environmental entities. Instead, they may include manufacturers, agricultural processors, mining operations, public utilities, and national energy laboratories. These hazardous waste generating organizations employ about as many individuals in environmental jobs as do environmental services firms. In combination, these two sectors of the environmental industry include nearly two million American workers, about 1.5% of the employed civilian workforce" (9).

Related to Our Subgroups

If, as previously reported, the trend in the next several years will be away from remedial activities and toward prevention, it would seem obvious that all the subgroups we have identified would benefit.

It may be less obvious that the FORT subgroup will find the possibilities of employment increasing at the same pace as the other three subgroups. However, we contend that this group will see an increase in employment as well. Few of the Superfund sites in the United States have been remediated since Superfund's inception in 1986. In the state of Florida alone, some have estimated that over 10,000 underground storage tanks exist. Of these, it has also been widely estimated that approximately one-quarter are leaking their contents into the surrounding environment. At an industry-wide accepted standard of $150,000 to $250,000 to effectively remediate a site involving discharges from underground storage tanks, a total of between $375 million and $625 million could be required to clean up the contamination presented by these sites alone. Presently, the state of Florida has been setting aside approximately $19 million each year for the cleanup of sites contaminated by leaking underground storage tanks. Even doubling or tripling the annual amount of dollars available from the state of Florida would not begin to significantly decrease the number of years it would take to remediate these sites.

Our experience has shown us that each situation, while different, is not necessarily unique. Therefore, while underground storage tank cleanup may not be the major concern in another part of the United States, we assume that other situations and conditions exist elsewhere that will be of vital concern on a per capita basis to that area. Therefore, we assume that FORT opportunities will continue to exist in the foreseeable future.

In regard to the two major potential employers identified earlier, we expect that the services of all four subgroups will be required by both segments. This expectation is based on the activities we have defined for these subgroups and the interrelated needs of the two segments of potential environmental employers.

Principal Skills Required for Each Subgroup

The principal skills required for technicians in each of the subgroups, as we have defined them, are not to be confused with those skills which we consider to be basic skills, such as written and verbal communication skills, teamwork, and physical ability. The principal skills consist of those necessary on a higher level for an HMMT technician to effectively perform the tasks required.

As seems obvious from Table 2, the tasks each subgroup HMMT technician may be required to undertake in a typical day overlap the tasks of other subgroups. That is to say, none of the subgroups appears to be able to claim sole ownership of the activities offered. In our estimation, this means that the principal skills must be shared across the subgroup boundaries. It does seem obvious that the LAT should possess a well-developed principal skill in laboratory testing techniques. However, it is also apparent that the FORT should possess an understanding of and appreciation for laboratory practices to be able to provide the LAT with a sample for analysis or to develop a sampling program.

In short, what we are saying is that, while each subgroup may find it necessary to develop a keen understanding or skill level in a particular area, it is also necessary for the subgroups to share common abilities and understandings.

Identify and Categorize

The goal of the current project is to identify and categorize job requirements, not to produce a training curriculum. In addition, this project does not attempt to associate the skills with any particular type of school or degree. We do expect that the required skills can be grouped into specific categories as shown in Figure 2. Even though a specific certification or degree does not guarantee the acquisition of these skills, we do expect that a minimum of an Associate of Science or an Associate of Applied Science degree may be necessary.

Biochemical core skills are required by many technologies grounded in biology or chemistry. It is, however, necessary to analyze these very carefully because the same topic may need to be understood at different levels. For example, a chemical laboratory technician may need to understand that pH is a logarithmic expression that defines the hydrogen ion concentration. This technician may also need to understand and manipulate the relationship: pH=log H+. An HMMT technician, however, may not need to understand that pH is a measure of acidity or alkalinity with a value of 7 being neutral. He or she may simply need to know how to take soil or water samples, measure their pH with a given meter, and verify that the value is within acceptable limits.

Conclusion

The HMMT study identifies basic skills technicians must possess to be effective as entry-level personnel in the environmental field. These skills have been identified by a national advisory committee through a grant from the federal government, specifically the Department of Education and the Department of Labor. The identification of this basic skills standard was achieved through a cooperative effort between people involved in the many facets of the environmental industry, government, and education.

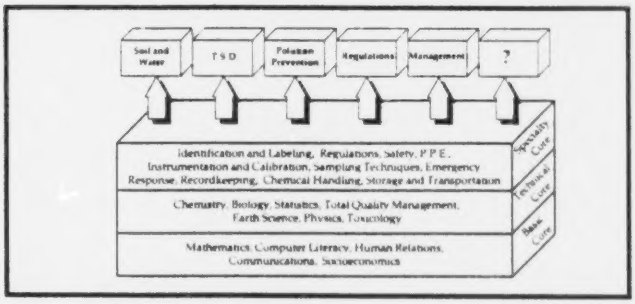
Soil and Water
TSD
Pollution Prevention
Regulations
Management
?
Identification and Labeling, Regulations, Safety, P.P.E., Instrumentation and Calibration, Sampling Techniques, Emergency Response, Recordkeeping, Chemical Handling, Storage and Transportation
Chemistry, Biology, Statistics, Total Quality Management, Earth Science, Physics, Toxicology
Mathematics, Computer Literacy, Human Relations, Communications, Socioeconomics
Specialty Core
Technical Core
Basic Core

Figure 2. Curriculum Concept.

Additional specialty skills may be developed or required because of an individual's interests, on-the-job training, or the unique requirements of an employer. These additional skills would represent advanced skill levels acquired after employment.

Further assessment and identification by an HMMT national advisory committee whose mission would be to certify that individuals have achieved the skills needed to meet minimum industry-based skill requirements may be desirable. The task of standardizing skills standards by developing a conscientious and investigative certification process to verify that they have been acquired, represents additional work beyond the original scope of the project.

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Robert Bear, P.E., Facilities and Environmental Consultants, Inc., Longwood, FL 32779-5709

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3. ibid., p. 11.
4. *Dictionary of Occupational Titles (1985)*, Chronicle Guidance Publications, p. 4.
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6. ibid., p. 70.
7. ibid., p. 71-74.
8. Camardo, p. 6-7.
9. Hudis, p. 67-68.

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EMPLOYERS WANT THE "SOFT" SKILLS IN A TECHNICAL ENVIRONMENT

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September 30, 1995

Introduction

A recent study, based on research conducted by the author, has provided insight into the importance industry places on the necessary skills for entry-level employment in a technical environment. These include the ability to interpret instructions, to communicate effectively, and to work as a member of a team—the so-called "soft" skills.

Working in a technical environment requires significant nontechnical knowledge that must be imparted to students prior to their employment. Historically, training for a career in a technical environment has not always included the development of soft skills.

Background Information[1]

Until recently, the United States has been the only major industrialized nation without standards defining the skills required for industrial occupations. Recognition of the need for measurable skills standards was highlighted in *Goals 2000: Educate America*, a document produced by the Clinton administration. In this publication, top priority was given to the development of skills standards for certain key occupations.[2] The purpose of these skills standards is to identify the knowledge, skills, attitudes, and level of ability an individual needs to successfully enter the workplace.

For the past two years, the author has been involved with the Center for Occupational Research and Development (CORD) as a technical advisor, a project team member, and chairperson of the National Advisory Committee in the development of skills standards for one of these key occupations: Hazardous Materials Management Technology. The project team for this endeavor consisted of community college educators, association representatives, and technical advisors; the National Advisory Committee was made up of representatives of various industries in the United States.

The work of the project team and the National Advisory Committee involved an eighteen-month assessment of the requirements of various industries located throughout the United States for technicians in entry-level positions. The result of the project was the publication by CORD of the

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[1] The Background Information Section was borrowed from the following two sources:

> *National Voluntary Skills Standard, Hazardous Materials Management Technology*, James R. Johnson, Project Director, Center for Occupational Research and Development, Waco, Texas, January 1995.
>
> "The Development of a Skills Standard for Hazardous Materials Management Technology Technicians," James R. Johnson and Robert L. Bear, P.E., *Journal of Environmental Health, Volume 57, Number 6*, National Environmental Health Association, Denver, Colorado, January/February 1995.

[2] Under separate grants from the U.S. Departments of Education and Labor, skills standards have been or are being developed for 22 industries. These include the following:

1. Health Science
2. Electronics (ED)
3. Computer-Aided Drafting and Design
4. Air Conditioning and Refrigeration
5. Electronics Construction
6. Biotechnical Sciences
7. Chemical Process Industry
8. Auto Service
9. Human Services
10. Hazardous Materials Management Technology
11. Electronics (DOL)
12. Heavy Highway and Environmental Remediation
13. Photonics
14. Printing
15. Metal Working
16. Agriculture
17. Industrial Launderers
18. Welding
19. Food Marketing
20. Forest and Wood Products
21. Tourism, Travel, and Hospitality
22. Retail Trade

National Voluntary Skills Standard, Hazardous Materials Management Technology (Skills Standard)[3] in January 1995.

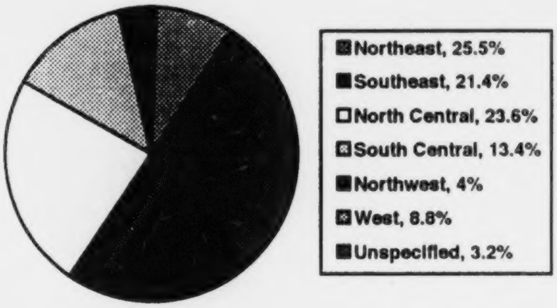
The main portion of the *Skills Standard* identifies skills required for thirteen job functions industry representatives have indicated they want entry-level hazardous materials technicians to perform. Also included in the document are five academic skills and three basic background skills that were deemed important by the National Advisory Committee. These basic background skills are the so-called "soft" employability skills.

Since January 1995, the author has focused on the validation and verification of the standard, including the basic background skills. This was accomplished through the use of an extensive survey completed by managers of hazardous materials technicians from various industries located throughout the United States.

The purpose of this report is to compare the basic background skills called for in the standard with the academic skills—soft skills—that respondents looked for in entry-level technicians. On the basis of the results, the importance of these "soft" skills in preparation for entry-level positions is significant.

Survey Methodology

Information was obtained from a survey mailed to approximately 5,800 people involved in the management of environmental personnel in various industries. The surveys were distributed by the National Association of Environmental Professionals and the National Environmental Training Association to people on their respective mailing lists. From the mailing, 373 surveys (approximately six percent) were returned. From the responses, the following demographic information was made available:



Graph 1
Regions of the United States

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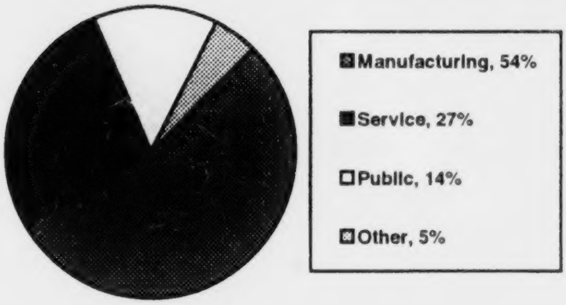
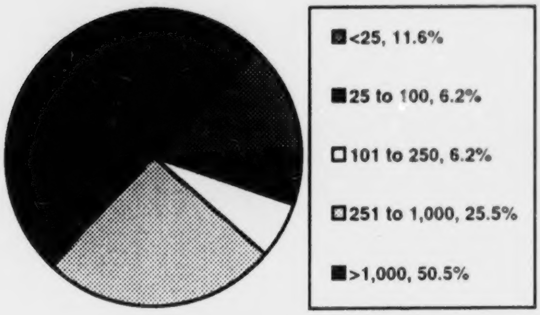
[3] A copy of this document may be secured from the Center for Occupational Research and Development, P.O. Box 21689, Waco, Texas 76702-1689, (800) 972-2766.



Graph 2
Type of Company



Graph 3
Number of Employees

Each respondent was asked to rate the thirteen identified desirable job functions, five academic skills, and three basic background skills on a five-point Likert scale of importance.[4] The choices for each item were as follows:

1	2	3	4	5
Not Important				Very Important

The statements to be evaluated concerning the academic and basic background skills were as follows:

1. A hazardous materials technician must have a background in mathematics. This must include the completion of a secondary-level mathematics curriculum, including algebra and geometry. (Academic Skill 1, A1)

2. A hazardous materials technician must have a background in science. This must include an understanding of the interrelationships between chemistry, toxicology, and biological systems. (Academic Skill 2, A2)

3. A hazardous materials technician must have a background in physics. This must include the ability to apply the concepts of physics to mechanical, thermal, electrical, and fluid systems. (Academic Skill 3, A3)

4. A hazardous materials technician must have a background in computer applications. This must include the use of hardware, word processors, spreadsheets, databases, and communications programs. (Academic Skill 4, A4)

5. A hazardous materials technician must be able to apply statistical quality-control techniques to situations. (Academic Skill 5, A5)

---

[4] Additionally, respondents were asked to indicate how often technicians in their organizations use the thirteen skill functions. The skill functions were separated from the academic and basic background skills because they deal with the more specific skills required of hazardous materials technicians and are not, typically, as general in nature.

6. A hazardous materials technician must be able to locate, understand, and interpret written information in prose and in documents such as manuals, graphs, and schedules. (Basic Skill 1, B1)

7. A hazardous materials technician must be able to communicate thoughts, ideas, information, and messages in writing. (Basic Skill 2, B2)

8. A hazardous materials technician must be able to work and communicate as a member of a team. (Basic Skill 3, B3)

Survey Results

On a percentage basis, the following responses were received:

	n	1	2	3	4	5	σ
Academic 1	370	5.7	15.9	33.0	25.9	19.5	1.134
Academic 2	371	0.3	5.4	17.8	36.1	40.4	0.901
Academic 3	371	10.5	23.5	39.4	20.8	5.9	1.043
Academic 4	372	4.6	15.6	30.9	32.5	16.4	1.076
Academic 5	369	8.1	19.5	33.3	29.0	10.0	1.094
Basic 1	372	0.3	2.4	5.4	36.0	55.9	0.731
Basic 2	372	0.5	1.9	6.2	40.1	51.3	0.736
Basic 3	371	1.0	0.8	4.3	16.4	77.4	0.726

Table 1
Responses, %

Of particular interest was the number of survey responses that indicated a 4 or a 5 on the Likert scale of importance. On this basis, the following table of percentages was generated:

Academic 1	45.4
Academic 2	76.5
Academic 3	26.7
Academic 4	48.9
Academic 5	39.0

Basic 1	91.9
Basic 2	91.4
Basic 3	93.8

Table 2
Preferential Responses, %

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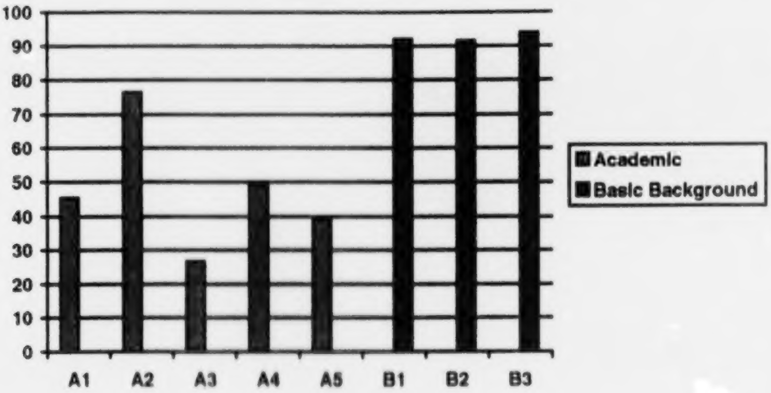
Graphically, the responses compare as follows:



Graph 4
Comparison of Academic and Basic Background Skills

Conclusions

The results of the survey highlight the importance of equipping entry-level persons with the soft employability skills. They indicate that the basic background, soft skills such as the interpretation of written information and the ability of an individual to both communicate and work effectively as a member of a team were considered to be of importance to over 90% of all of the respondents. As noted by Lynn A. Corson, Ph.D., these skills that are normally taught in a liberal arts course of study and not in a technical curriculum.[5]

The environment in which hazardous materials technicians work is technical in nature. They are called upon to perform tasks that are exact and that require the analysis and interpretation of scientific data. While the specific skills required for hazardous materials technicians may be somewhat different from those required in other technical environments, it can be argued that they are not unique. Technical environments—such as accounting, engineering, medicine, metal working, and a host of others—are all exact in nature and also require close attention to detail, procedures, and data. Therefore, it appears that the results of this study may be transferable to other technical environments.

In a study dealing with the skills required for graduate accountants, Helen A. LaFrancois surveyed accounting firms. In parallel with the results of our study, Ms. LaFrancois seemed to be concerned with the fact that colleges were not teaching the skills deemed by practitioners to be necessary in successful accountants. From the results of her survey she noted that "... on the top of the list of needed skills, and of those needing improvement, are those involving the communication arts."[6]

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[5] Dr. Corson is the Director of the Indiana Pollution Prevention and Safe Materials Institute, Purdue University, West Lafayette, Indiana, and serves on the National Advisory Committee. His comment was made at a meeting of the National Advisory Committee in Reno, Nevada, on July 29, 1995.

[6] "Dear (CPA Firm): How Do the Skills of Your New Graduate Accountants Match the Skills You Need?" Helen A. LaFrancois, *Journal of Career Planning and Employment*, Bethlehem, Pennsylvania, Fall 1990, pages 71ff.

In 1993, Constance J. Pritchard and Paul P. Fidler reported on their study of 555 small business organizations, each with less than 500 employees. They, too, had concerns about the skills required by various companies hiring new graduates. From the results of their study, they concluded that the managers value a strong inner commitment *as well as team skills*."[7] While their sample group was not necessarily concerned with companies involved in technical environments, their results indicate the relative importance of teaching team skills similar to those discovered in our study.

Most succinctly, another journal author, Deborah Flores, wrote:

> Firms still want the 4-point-oh'ers, but communication and working-along-with-others skills are coming to be just as important.[8]

Over 90% of the industry managers who responded to our survey considered the employability skills as strongly desirable. This is especially surprising when one considers the relative variance from the traditional areas of education (mathematics, science, statistics, and computers) of individuals preparing for technical careers as indicated by the respondents. Of these, only Academic Skill 2 (a background in science) was viewed as desirable by over 50% of the respondents.

From the results of our survey, it appears that the managers in the technical fields are saying, "Give us people with well-rounded backgrounds in the basic technical skills, *but make sure they can communicate and work well with others*. We can then train them to do the rest."

Paying attention to the results of the survey becomes critical when one considers where the greatest potential for employment is. According to the most recent report of the Collegiate Employment Research Institute, Michigan State University, "The job opportunities are predicted to be in the hotels/motels industry, *computer systems occupations, engineering, accounting and finance,* sales and marketing, *medical and health care occupations, environmental fields, science and economic development*." It is interesting to note that of the nine categories identified, seven were in technical fields. Additionally, Patrick Scheetz, the director of the Institute, has stated "... graduates who exhibit computer and *teamwork skills* stand a better chance of landing a job."[9]

If it is true that the job opportunities lie in the technical fields, the results of our survey indicate that creating opportunities for students to develop the soft skills while mastering the technical skills Iis essential. For those who are providing training and learning services, the challenge then will be to provide curricula and learning opportunities that foster the development of communication and team skills simultaneously with the learning of technical and academic and skills.

---

[7] "What Small Firms Look for in New Graduates," Constance J. Pritchard and Paul P. Fidler, *Journal of Career Planning and Employment*, Bethlehem, Pennsylvania, Spring 1993, pages 45ff. The emphasis is the author's.

[8] "Wanted: Team Players for the 1990's," Deborah Flores, *Journal of Career Planning and Employment*, Bethlehem, Pennsylvania, Summer 1992, pages 67ff.

[9] "Job Market Looks Strong," *Orlando Sentinel*, Orlando, Florida, December 6, 1994. The emphasis is the author's.

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Site Visits

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Site	Date	Staff Member
Dallas Ft-Worth Sectional American Chemical Society meeting Dallas, TX	January 20, 1994	Woody Baker
EG&G of Florida Cape Canaveral, FL	August 14, 1994	Staff member
Wright-Patterson Air Force Base	September 9, 1994	
Tupperware Orlando, FL	September 14, 1994	Staff member
Kelly Air Force Base Kelly Air Force Base, TX	September 14, 1994	Jim Johnson
Marathon Power Technologies Waco, TX	September 21, 1994	Staff member
Plantation Foods, Inc. Waco, TX	September 27, 1994	Staff member
Glace & Radcliffe and Associates, Inc. Maitland, FL	September 29, 1994	Staff member
Allergan, Inc. Waco, TX	September 30, 1994	Staff member
Sherwin-Williams Company Waco, TX	October 25, 1993	Staff member
PDG Environmental, Inc. Titusville, FL	November 8, 1993	Staff member
3M Austin, TX	November 12, 1993	Staff member
Radian Corporation Austin, TX	November 12, 1993	Staff member

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Environmental Technology
Skills Standard Update

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Example Presentations

These presentations were made at site visits, conferences, and meetings.

Translating Skill Standards into Educational Programs

Jim Johnson
Sr. Research Associate
Center for Occupational
Research and Development
1-800-972-2766

Skill Standards Defined

- They identify the knowledge, skills, attitudes and level of ability an individual needs to perform successfully in the workplace.

Characteristics of Skills Standards

- Occupational Orientation
  - more than a job description
  - more than a DACUM
- Industry Lead
  - more than an advisory committee
- Industry Validated
  - buy- in, consensus
  - partnerships

Skills Standards are *NOT*

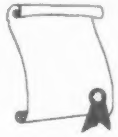
- Magic
- Course Outlines
- Developed Over Night
- Statements of Educational Objectives

Skills Standards DO

- Provide students with better information about an occupation before entering it
- Businesses will be provided with better information to hire highly skilled workers
- Accountability among training providers due to measurable standard
- Guide curriculum and program development

Skills Standards ALSO

- Give guidance for occupational assessment
- Set a standard for the development of certification programs



National Skills Standards

- Joint effort
  - Department of Education
  - Department of Labor
- Cornerstone of Clinton's Administrations workforce development system
- Twenty- two projects funded represent approximately 25% of US. workforce

National Skills Standards Format

- Format varies but typically includes
  - definition of the occupation
  - job oriented tasks and / or skills
  - academic or general skills
- Oriented toward Task Analysis
- Needs expansion to give direction to training programs

National Skills Standards Sample Format, HMMT

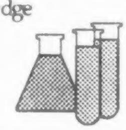
- Define occupation (ex: Hazardous Materials Management Technician)
  - Entry level
  - Areas of employment include
    - Field remediation
    - Transportation, storage & disposal
    - Regulations / compliance
    - Laboratory/analytical
  - Compliance Based Training Requirements

National Skills Standards Sample Format, HMMT

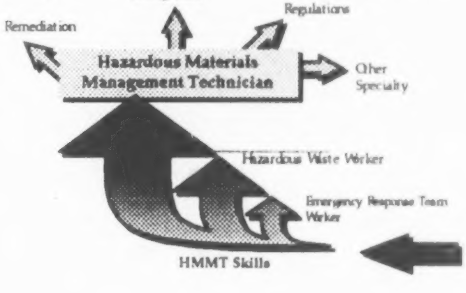
- Job Functions
  - 13 different job functions
  - may not be needed by all employees
- Enabling Skills and Knowledge
  - specific tasks
  - general knowledge

National Skills Standards Sample Format, HMMT

- "Academic" Skill and Knowledge
  - Mathematics
  - Chemistry
  - Physics
  - Computer
  - Toxicology
- Employability Skills (SCANS)
- Quality Movement
- Curriculum Development



Hazardous Materials Management Occupations


Management
Regulations
Remediation
Hazardous Materials Management Technician
Other Specialty
Hazardous Waste Worker
Emergency Response Team Worker
HMMT Skills

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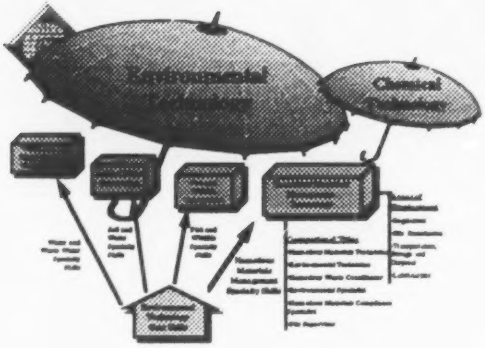
How will *Industry* use Skills Standards?

- Incorporate into Job Descriptions
- Responsibility Section of HazMat Manual
- Evaluate Existing Personnel
- Develop Training Programs
- Upgrading Staff
- Evaluation of Performance
- Baseline for Entry Level Personnel
- To be used by Tech Prep Consortium

How will *Education* use Skill Standards?

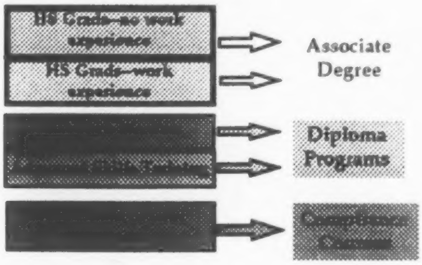
- Evaluate Existing Programs
  - compatible with local industry needs
  - modify national standard to meet local variations
- Curriculum Development
  - TPAD/seamless curriculum
  - Develop new programs


Environmental
Chemical
Hazardous Materials Management Specialty Skills

Goals of Phase 2

- Validation
- Dissemination
- Assessment, Certification, and Accredation
- Curriculum Guidance

Educational Paths
--postsecondary--



HS Grads--no work experience

HS Grads--work experience

Associate Degree

Diploma Programs

Compliance Courses

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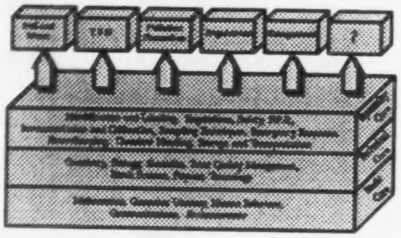
Curriculum Concept
Hazardous Materials Management Technicians



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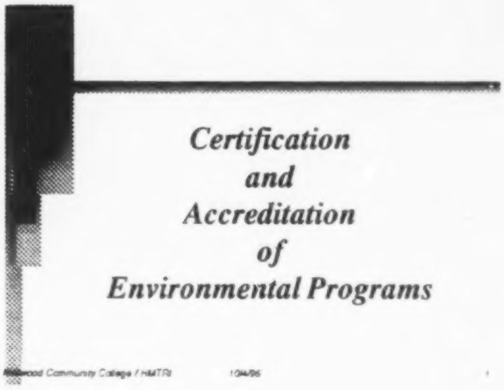
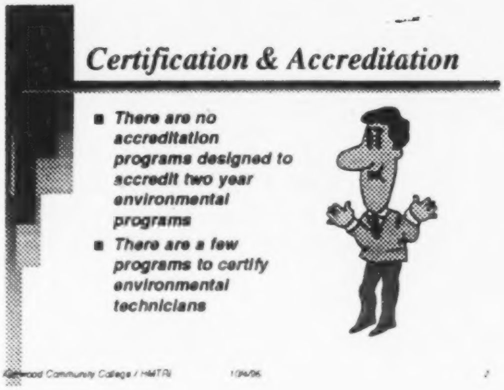
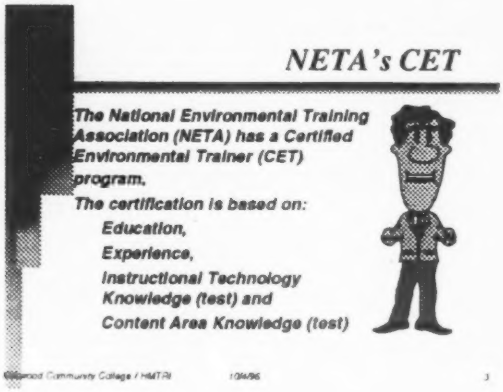


Certification
and
Accreditation
of
Environmental Programs



Certification & Accreditation

- There are no accreditation programs designed to accredit two year environmental programs
- There are a few programs to certify environmental technicians

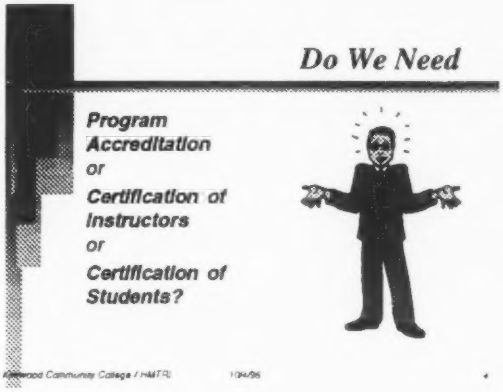


NETA's CET

The National Environmental Training Association (NETA) has a Certified Environmental Trainer (CET) program.

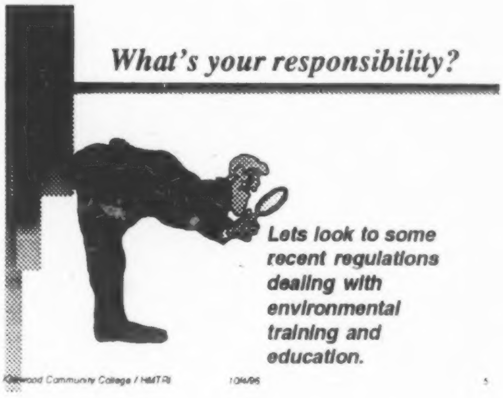
The certification is based on:

- **Education,**
- **Experience,**
- **Instructional Technology Knowledge (test) and**
- **Content Area Knowledge (test)**



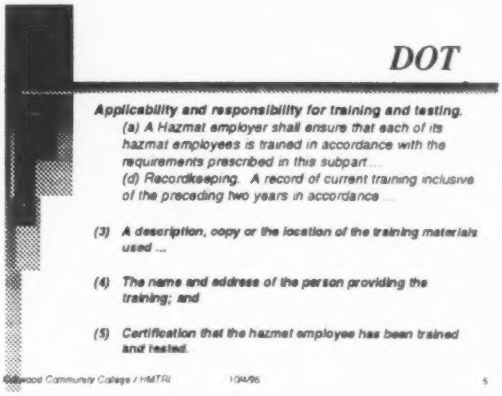
Do We Need

Program Accreditation
or
Certification of Instructors
or
Certification of Students?



What's your responsibility?

Lets look to some recent regulations dealing with environmental training and education.



DOT

Applicability and responsibility for training and testing.

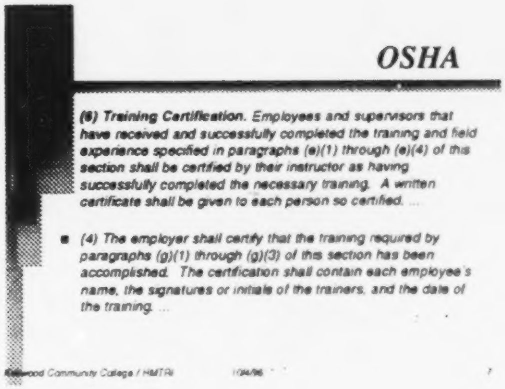
(a) A Hazmat employer shall ensure that each of its hazmat employees is trained in accordance with the requirements prescribed in this subpart....

(d) Recordkeeping. A record of current training inclusive of the preceding two years in accordance ...

(3) A description, copy or the location of the training materials used ...

(4) The name and address of the person providing the training; and

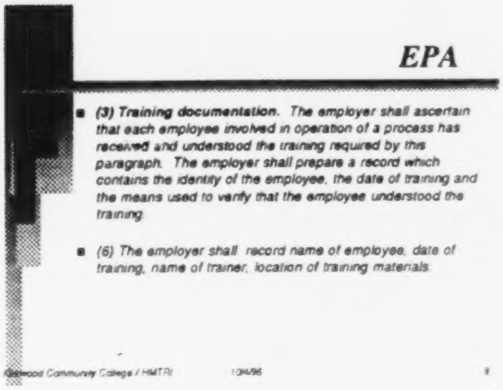
(5) Certification that the hazmat employee has been trained and tested.



OSHA

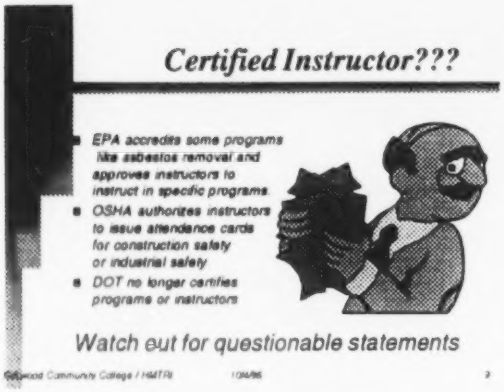
(6) Training Certification. Employees and supervisors that have received and successfully completed the training and field experience specified in paragraphs (e)(1) through (e)(4) of this section shall be certified by their instructor as having successfully completed the necessary training. A written certificate shall be given to each person so certified. ...

- (4) The employer shall certify that the training required by paragraphs (g)(1) through (g)(3) of this section has been accomplished. The certification shall contain each employee's name, the signatures or initials of the trainers, and the date of the training. ...



EPA

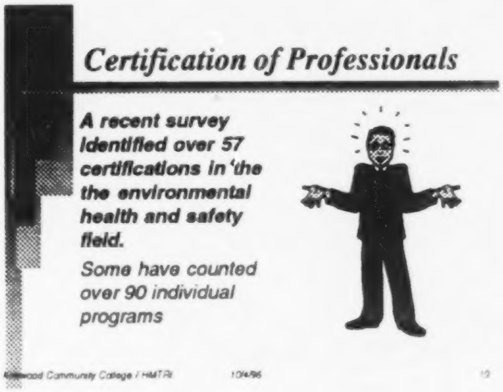
- **(3) Training documentation.** The employer shall ascertain that each employee involved in operation of a process has received and understood the training required by this paragraph. The employer shall prepare a record which contains the identity of the employee, the date of training and the means used to verify that the employee understood the training.
- (6) The employer shall record name of employee, date of training, name of trainer, location of training materials.



Certified Instructor???

- EPA accredits some programs like asbestos removal and approves instructors to instruct in specific programs.
- OSHA authorizes instructors to issue attendance cards for construction safety or industrial safety
- DOT no longer certifies programs or instructors

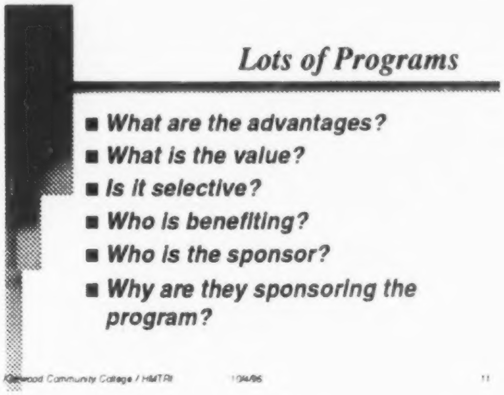
Watch out for questionable statements



Certification of Professionals

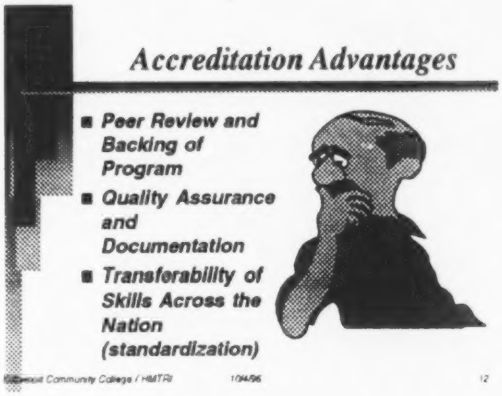
A recent survey identified over 57 certifications in 'the the environmental health and safety field.

Some have counted over 90 individual programs



Lots of Programs

- **What are the advantages?**
- **What is the value?**
- **Is it selective?**
- **Who is benefiting?**
- **Who is the sponsor?**
- **Why are they sponsoring the program?**



Accreditation Advantages

- **Peer Review and Backing of Program**
- **Quality Assurance and Documentation**
- **Transferability of Skills Across the Nation (standardization)**

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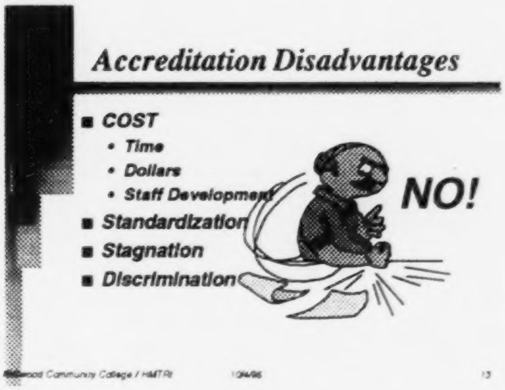

Accreditation Disadvantages

- COST
  - Time
  - Dollars
  - Staff Development
- Standardization
- Stagnation
- Discrimination

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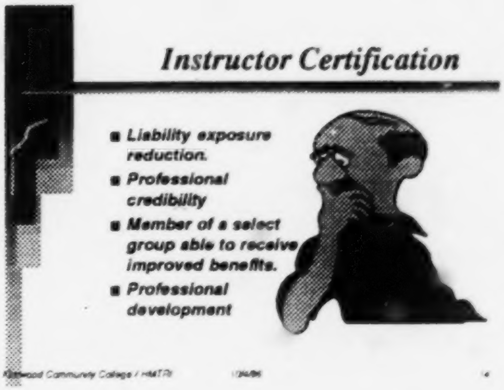

Instructor Certification

- Liability exposure reduction.
- Professional credibility
- Member of a select group able to receive improved benefits.
- Professional development

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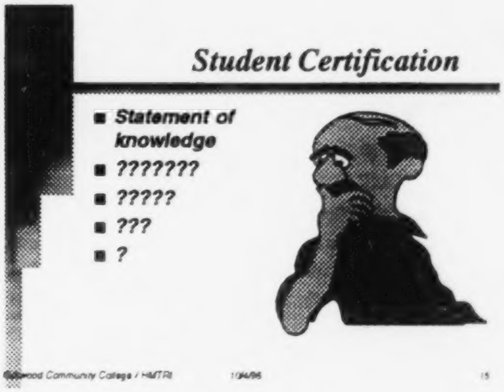

Student Certification

- Statement of knowledge
- ???????
- ?????
- ???
- ?

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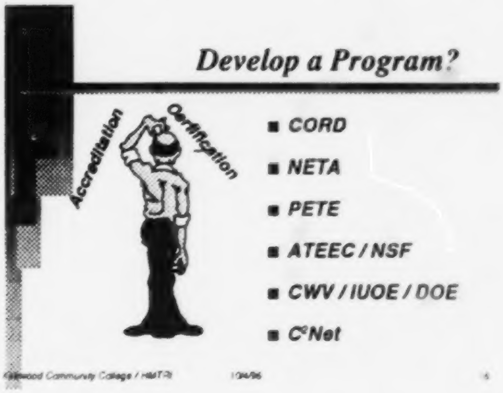
Accreditation
Certification

Develop a Program?

- CORD
- NETA
- PETE
- ATEEC / NSF
- CWV / IUOE / DOE
- C^2Net

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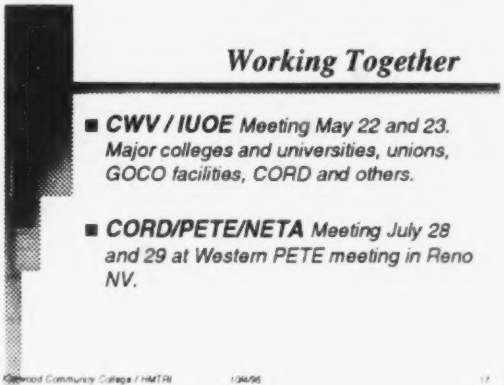

Working Together

- **CWV / IUOE** Meeting May 22 and 23. Major colleges and universities, unions, GOCO facilities, CORD and others.
- **CORD/PETE/NETA** Meeting July 28 and 29 at Western PETE meeting in Reno NV.

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What TECH are we PREPping for?

Rob Auld
Executive Director
National Coalition of Advanced Techology Centers
Center for Occupational Research and Development

TECH PREP
A Broad Definition

Tech Prep is a set of principles that guide a process of curriculum reform, leading to desired improvements in the educational system.

TECH PREP is

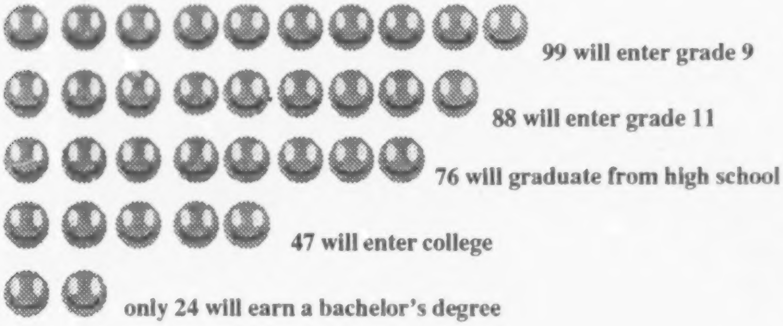
- Designed for the *Neglected Majority*
  - those students in the middle 50% of the high school population that are not college bound
- Analogous to "College Prep"
  - college prep directs students toward a Bachelor Degree
  - tech prep directs students toward an Associates Degree with a career focus
- Career Oriented

TECH PREP also

- Encourages a "seamless curriculum"
  - 2+2+2 or better yet 4+2+2
  - reduces repetition of studies by developing "articulation" agreements
- Encourages partnerships with business and industry
- Presents new materials and information in the way most students learn best
  - contextual methods

The Narrowing Pyramid

For every 100 students in grade 5:



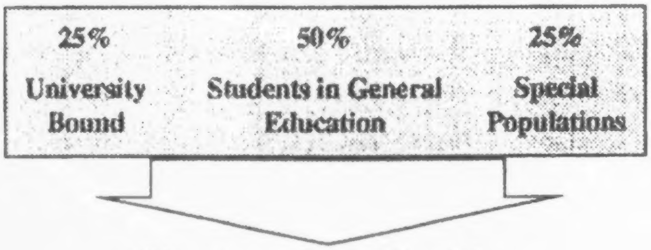
National Center for Educational Statistics, October 1991

The Neglected Majority

by Dale Parnell

"The academic and vocational desert of American education is the high-school general-education program ... Unfocused learning remains one of the prime barriers to achieving excellence for a host of high-school students."

Who are the Neglected Majority in High Schools?

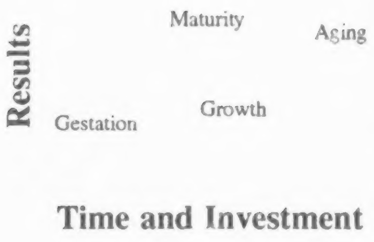


25%	50%	25%
University Bound	Students in General Education	Special Populations

The American Workforce

The Economic Engine Drives Education

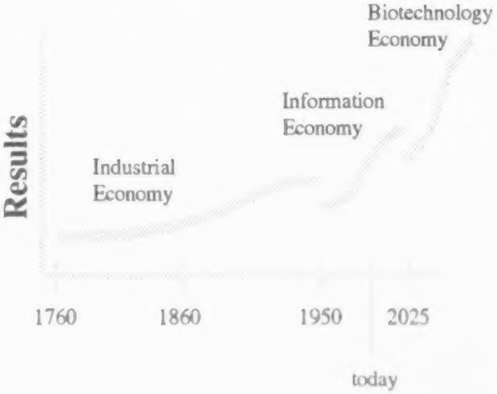
The Life Cycle of a Person, Technology or an Economy



- Gestation
  - newborns require an enormous amount of energy
- Growth
  - Investment pays off, output accelerates, returns high
- Maturity
  - Reining Supreme
- Aging
  - Vitality and results diminish

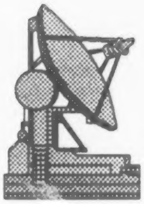
Past and Future Economies

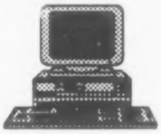
- **Agricultural**
- **Industrial**
- **Information**
- **Biotechnology**



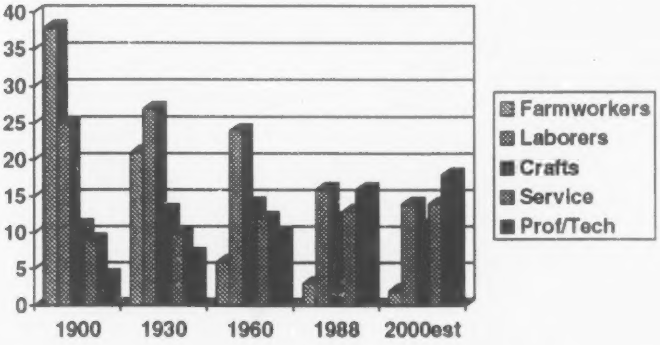
The Information Age

The Department of Labor estimates that by the year 2000 at least 44% of all workers will be in data services--for example, gathering, processing, retrieving, or analyzing information





Occupational Categories as a Percentage of the Labor Force



Various sources, by Stephen Barley, EQW Working Papers, The New Crafts:..., Cornell University

“Technization” of the workforce

“...professional and technical workers have been catapulted from the second most peripheral occupational category to what may be the core of the labor force by the next century.”

from: The New Crafts: The Rise of the Technical Labor Force and its Implications for the Organization of Work by Stephen R. Barley, Cornell University, School of Industrial and Labor Relations. 1992

What is a Technician?

- hundreds of studies regarding blue-collar, clerical, managerial and professional work, but
- few studies about technician occupations have been published
- typically come from the “neglected majority” (general education curriculum)
- NOT “junior professionals” or “frustrated engineers”

Technicians are NOT Junior Engineers

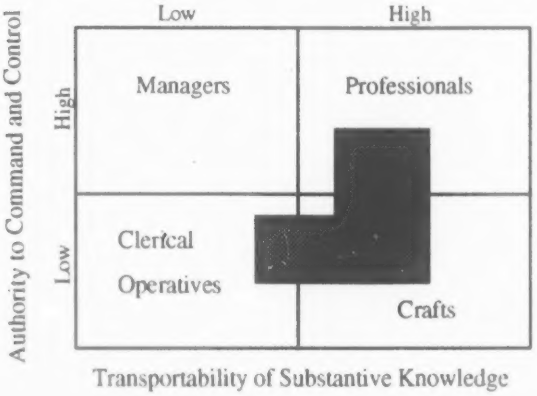
"...the concept that technicians are 'junior professionals' **misrepresent the technicians role.**"

"the image of a 'junior professional' is **inaccurate**, it may lead educators to develop curricula that are, at best, irrelevant and, at worst, a barrier to entry."

" We have found instead that the division of labor between technicians and professionals is usually more collaborative (horizontal) than hierarchical (vertical) and that members of the two types of occupations command **substantively different knowledge and skill**."

from What Do Technicians Do? by Stephen R. Barley, School of Industrial and Labor Relations, Cornell University, 1993

Occupational Categories by Dimensions Critical to Horizontal and Vertical Divisions of Labor


Low
High
Authority to Command and Control
High
Low
Managers
Professionals
Clerical
Operatives
Crafts
Transportability of Substantive Knowledge

from "The New Crafts by Stephen R. Barley

Technicians vs Professionals

- Technician occupations require formal knowledge of science, math, and technology yet their most valued skills are developed in a hands-on conversation with materials and techniques
- Professionals possess greater formal knowledge but rarely possess the artisanal skills critical to the success of experiments, tests and measurements

Characteristics of Workers in High Performance Workplaces

Quotes--Peter F. Drucker

- In 1960 almost 1/2 of all workers in the industrial countries were involved in making things
- By 2000, no developed country will have more than 1/6 to 1/8 of its workforce in traditional roles of making or moving goods
- "knowledge" is becoming our most important "product"
- **This calls for different organizations, as well as different kinds of workers**

"13 Ground Rules for Job Success in the INFORMATION AGE"

Price Pritchett

1. Become a quick-change artist

"You think you understand the situation, but what you don't understand is that the situation just changed."--Putman Investments advertisement

“13 Ground Rules for Job Success in the INFORMATION AGE”

Price Pritchett

2. Commit fully to your job

“They’re only puttin’ in a nickel, but they want a dollar song.”
--Song title

“13 Ground Rules for Job Success in the INFORMATION AGE”

Price Pritchett

3. Speed Up

“I have a microwave fireplace. You can lay down in front of the fire all night in eight minutes.”--Steven Wright

“13 Ground Rules for Job Success in the INFORMATION AGE”

Price Pritchett

4. Accept ambiguity and uncertainty

“Every year more and more people will be self-employed.

Many will work temporary or part-time--sometimes because that’s the way they want it, sometimes because that’s all that is available.”--John Hardy, *The Age of Unreason*

“13 Ground Rules for Job Success in the INFORMATION AGE”

Price Pritchett

5. Behave like you’re in business for yourself

“There has been more information produced in the last 30 years than during the previous 5,000.

The information supply available to us doubles every 5 years.”--Richard Saul Wirman, *Information Anxiety*

"13 Ground Rules for Job Success in the INFORMATION AGE"

Price Pritchett

6. Stay in school

"There are two kinds of people, those who finish what they start and so on..."--Robert Byrne

The cost of computing power drops roughly 30% every year, and microchips are doubling in performance power every 18 months.--*Business Week*

"13 Ground Rules for Job Success in the INFORMATION AGE"

Price Pritchett

7. Hold yourself accountable for outcomes

"Somebody has to do something, and it's just incredibly pathetic that it has to be us."

--Jerry Garcia of the Grateful Dead

"13 Ground Rules for Job Success in the INFORMATION AGE"

Price Pritchett

8. *Add value*

The first practical industrial robot was introduced during the 1960's, today there are over 20,000,000.

"The factory of the future will have only two employees, a man and a dog. The man will be there to feed the dog. The dog will be there to keep the man from touching the equipment."

--Warren Bennis, Professor of Business Administration, University of Southern California

"13 Ground Rules for Job Success in the INFORMATION AGE"

Price Pritchett

9. *See yourself as a service center*

"Today's average consumers wear more computing power on their wrist than existed in the entire world before 1961."

--Ian Morrison and Greg Schmid

“13 Ground Rules for Job Success in the INFORMATION AGE”

Price Pritchett

10. Manage your own morale

Computer power is now 8,000 times less expensive than it was 30 years ago. If we had similar progress in automotive technology, today you could buy a Lexus for about $2. It would travel at the speed of sound, and go about 600 miles on a thimble of gas.”–John Naisbitt, *Global Paradox*

“13 Ground Rules for Job Success in the INFORMATION AGE”

Price Pritchett

11. Practice kaizen

kaizen is Japanese for “*continuous improvement*”

“13 Ground Rules for Job Success in the INFORMATION AGE”

Price Pritchett

12. Be a fixer, not a finger-pointer

“ We have only one person to blame, and that’s each other.”

--Larry Beck, New York Ranger

“13 Ground Rules for Job Success in the INFORMATION AGE”

Price Pritchett

13. Alter your expectations

Look at the roster of the 100 largest U.S. companies at the beginning of the 1900’s. You’ll find that only 16 are still in existence.

During the decade of the 1980’s, a total of 230 companies--46%--disappeared from the “Fortune 500”.

“The significant problems we face today cannot be solved at the same level of thinking we were at when we created them”--Albert Einstein

New and Emerging Technologies

- Advanced Materials
- Artificial Intelligence
- Digital Imaging
- High Density Storage
- Software Producability
- Photonics (optoelectronics)
- Superconductivity
- Medical Devices and Diagnostics
- Visualization
- Biotechnology
- Microelectronics
- Environmental Technology

ORD
TM

Meeting Attendance Request

Included are several example letters requesting presentations on the skills standard project.

NORTH CENTRAL PARTNERSHIP FOR ENVIRONMENTAL TECHNOLOGY EDUCATION

P.O. Box 2068
Cedar Rapids, Iowa 52406
(319) 398-5677 FAX: (319) 398-1250

Mr. Jim Johnson
Senior Research Associate
C.O.R.D.
601 Lake Air Drive
Waco, TX 76710

March 29, 1995

Dear Mr. Johnson:

Thank you so much for your willingness to address the 1995 North Central PETE conference on the critical issue of CORD and the Voluntary Skills Standards project. Your presentation was valuable, timely, and useful to the participants. In fact, your remarks were very highly rated by the conference participants on their conference evaluation forms.

I am especially thankful for your contribution of professional and personal time, particularly in light of the great demands on your resources. You were very important to the success of our conference!

Warmly,

AValentine

Ann M. Valentine
Regional Director, North Central PETE

cc: file

Mississippi State
UNIVERSITY

Division of Continuing Education
National Institute for Technology Training

February 17, 1995

Jim Johnson
HMMT Project Director
Center for Occupational Research
and Development (CORD)
P. O. Box 21689
Waco, TX 76702-1689

Dear Mr. Johnson:

I have enjoyed talking with you about our 1995 NITT Summer Institute to be held during the week of June 5-9, 1995, at Mississippi State University, and we are happy to learn that it might be possible for you to join us for this event.

By this letter we wish to formally invite you to be our keynote speaker at the Institute on Tuesday, June 6, 1995, from 9:15 a.m. to 10:00 a.m. As we discussed, immediately following your keynote address, we would like for you to give a presentation on National Voluntary Skill Standards (Hazardous Materials Management Technology.) NITT will pay you the actual cost of your travel to and from Mississippi State University, to include airfare (not to exceed regular coach rates), and your hotel accommodation at our Butler-Williams Guest House. If possible, we would appreciate your sending to us, as soon as possible, an abstract of your presentation, a short biography, and a black and white photograph for our use in maximizing our promotional activities for the Institute.

For your further information we are enclosing some information on NITT and our 1995 Summer Institute brochures.

We look forward to having you as our honored guest at the 1995 NITT Summer Institute. Please call if your should need additional information.

Sincerely,

Virgil Elam
Manager

VE:g

Enclosures

on desk -
-9666

NITT

P. O. Box 5247 • Mississippi State, Mississippi 39762-5247 • 601 • 325 • 3619 • FAX 601 • 325 • 8652

C. O. R. D.
SEP 15 1994
RECEIVED

ississippi Gulf Coast
COMMUNITY COLLEGE

Barry L. Mellinger, President

Royce B. Luke, Vice President
Jackson County Campus
P O Box 100 Gautier, MS 39553
Telephone: 601/497-9602

September 13, 1994

Mr. James Johnson
Senior Research Associate
Center for Occupational Research & Development
P. O. Box 21689
Waco, TX 76702-1689

Dear Mr. Johnson:

Thank you for responding to the American Technical Education Association (ATEA) Call for Papers for the 32nd National Conference on Technical Education being held in Biloxi, MS, on March 23-26, 1995.

It is my pleasure to indicate your proposal "What Tech are we Preping for? Focus on Post Secondary Programs" has been selected for the conference. A designated time for your presentation will be established and you will be notified later. One hour concurrent sessions will be held Friday afternoon, March 24 and all day Saturday, March 25.

Please fill out the enclosed information sheet and return it as soon as possible. Presenters are expected to register for the conference. A conference brochure and registration information will be available in November.

Again, I extend a special thanks for your proposal and interest in ATEA.

Sincerely,

Bennie Van Court

Bennie VanCourt
ATEA National Program Planning Committee

BV:qkp

Enclosure

DTI

April 6, 1996

Daniel M. Hull
The Center for Occupational Research and Development (CORD)
P.O. Box 21689
Waco, TX 76702

RE: RFI Work Assignment Number CRD-2

Dear Mr. Hull.

We are pleased to inform you that you have been selected by the State of Florida to provide technical assistance on Work Assignment Number CRD-2. The purpose of this work assignment is to make a presentation at the Florida STW conference. Specific work to be performed under this technical assistance subcontract is described in the attached Statement of Work. The total value of this work assignment is $1,065.00. (See attached budget.) The effective date of this work assignment is April 6, 1996. The period of performance is from April 22, 1996 to April 23, 1996.

The point of contact for Florida is:

John Marshall, State STW Coordinator
Department of Education
325 W. Gaines Street
Tallahassee, FL 32399-0400
904.488.7394
904.487.0426

If you have any questions about this work assignment, please call Glenda Stewart at 703.299.1638.

Sincerely,

F. Stuart Hodgson

F. Stuart Hodgson, DTI
Principal Officer

DTI, 2920 South Glebe Road, Arlington, Virginia 22206 (703) 299-1600 Fax: (703) 706-0476

National
SCHOOLTOWORK
Learning&InformationCenter

400VirginiaAve.,SW,Ste.210,Washington,DC20024,Tel.800-251-7236,Fax202-401-6211,stw-lc@ed.gov

TASK ORDER TECHNICAL ASSISTANCE REQUEST FORM

NATURE SAVER™ FAX MEMO · 01616

To Glenda Stewart	Date	# of pages ▶
Co./Dept.	From	
Phone #	Co.	
Fax #	Phone #	
	Fax #	

Requesting State: Florida

State Contact: John Marshall

Phone Number: 904 - 487 - 4325

Name of TA Provider: Jim Johnson / CORD

Brief description of services requested:
(Attach actual Statement of Work)

Mr. Johnson will be making a presentation at the Florida STW conference.

The presentation will cover (1) how national skill standards were developed, (2) how Florida STW can develop occupational skill standards, (3) the use of Curriculum Framework and Student Performance Standards.

Value of task: ~~$640.00~~ 1,065.00
(Attach budget)

Period of Performance Technical Assistance will occur: 4/22/96 -- 4/23/96

Remarks:

Internal Use Only
Date Received 4.4.96
Date Mod sent to TA provider 4.6.96
Tracking # CRD-2

Authorized Signature: John Marshall

Printed Name, Title: John Marshall, Fla STW Coordinator

Please return this form to : Glenda Stewart at DTI, 2361 Jefferson Davis Hwy. Suite 500
Arlington, VA 22202

: Learning Center
Marian Banfield/NSTWO

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TECHNICAL ASSISTANCE PROPOSED BUDGET WORKSHEET

Labor Plan

Staff Person		Approved RFI Rate		No. of Days		
Jim Johnson	x	425	x	1	=	425
	x		x		=	
	x		x		=	
	x		x		=	
	x		x		=	
				TOTAL LABOR	=	

Estimated Travel Expenses associated with this work assisgnment = ~~640.00~~ $*

Other Direct Costs associated with this work assisgnment = ____________

TOTAL ESTIMATED COSTS FOR THIS WORK ASSIGNMENT = ~~640.00~~ $ 1,065.00

y:\C504\FORMS\BUDGET.SAM

FLORIDA
School To WorK
CLEARINGHOUSE
YOUR GATEWAY TO RESOURCES

FAX TRANSMITTAL

DATE: 3-20-96

NO. OF PAGES (including this one): 5

FAX DOCUMENT TO:

ATTENTION: Jim Johnson
ORGANIZATION: CORD
FAX NUMBER: 817-772-8972
REC'V PHONE NUMBER:

FAX DOCUMENT FROM:

FLORIDA SCHOOL-TO-WORK CLEARINGHOUSE

SENDER: Hyo Lee
SUBJECT: Conference
COMMENTS:
As per our phone conversation,

Florida School-to-Work Clearinghouse • 251 Sliger Building • 2035 E. Dirac Dr. • Tallahassee, FL 32310
Phone: (904) 644-5549, (800) 428-1194 • Fax: (904) 644-8257 • E-mail: fl-stwcl@mailer.fsu.edu
Home page: http://www.fsu.edu/~flstwtp/fl-stwtp.html

Mar 20.96 10:10 No.001 P.01

FSU EDUC SERV PROG

SCHOOL TO WORK
FLORIDA
SCHOOL TO WORK

Call for Presenters
The Second Annual Florida School-to-Work Conference
Orange County Convention Center
Orlando, Florida
April 21–23, 1996

This is your invitation to submit an application to present at the 1996 Florida School-to-Work (STW) Conference. Come and share your knowledge, skills, and abilities; gain visibility among your colleagues; network; and enhance your own professional growth. This professional development conference is the premiere forum for all School-to-Work practitioners in Florida.

OUTCOMES

The teams of participants attending this conference will walk away with a short-range plan that can be incorporated and implemented into their local areas immediately and a long-range vision for a strategic, quality STW system. These teams will become builders of the powerful STW vehicle that will propel us into the next century.

OBJECTIVES

- To provide each participant with quality, hands-on training for developing a comprehensive STW system for all youth
- To engage employers, community partners, and other key beneficiaries of Florida workforce development as participants in the academic and career preparation of the youth of Florida

AUDIENCE

The target audience includes
- Regional STW leadership teams
- Local STW partnership teams
- Employers
- Teachers (K–Postsecondary)
- Counselors
- Administrators
- School boards
- Private industry councils
- Apprenticeship agencies
- Vocational rehabilitation agencies
- Jobs and benefits/ONE-STOP CENTERS
- Special population administrators
- Leadership from community-based organizations
- Trade associations
- Parent-teacher associations
- School improvement teams and school advisory councils
- Workforce development boards

STRANDS

School-Based Learning
- Career programs of study
- Integrated curriculum
- Elementary standards
- Middle school standards
- High school standards
- Tech Prep
- Guidance and counseling

Work-Based Learning
- Work experience
- Structured job training
- Worksite mentoring
- Youth apprenticeship
- Pre-apprenticeship
- Apprenticeship
- Cooperative training
- Certificates of mastery

Connecting Activities
- Continuous quality improvement
- Quality in the classroom
- Team building/problem solving/goal setting
- Training the trainers
- Strategic planning
- Evaluating STW programs
- Integrating school-based and work-based learning
- Promoting employer participation
- Integrating the classroom with on-the-job training
- Promoting employer participation
- Matching students with employers
- Job-site mentors
- Building STW bridges
- Networking employers, schools, and students
- Linking youth activities and business and industry
- Facilitating job placement
- Student organizations
- SCANS
- Labor market information
- Child labor laws

APPLICATION GUIDELINES

If you are interested in submitting a session idea for the conference, please complete the attached presenter application form and return by February 29, 1996, to

John Marshall, Program Chair
Florida School-to-Work Conference
School-to-Work Joint Services
325 West Gaines Street, Room 754
Tallahassee, FL 32399–0400

For more information, contact
John Marshall at
Phone: (904) 488-7394
Fax: (904) 488-3192
E-mail: fl-stwcl@mailer.fsu.edu

One presenter for each session will be given a complimentary registration. Additional co-presenters must register for all conference proceedings. **Please note: You may be asked to repeat your presentation. Most sessions will be set up for 80 people.**

SELECTION CRITERIA

All applications will be evaluated on
- Quality of proposed session
- Hands-on interactive format, activities for teams, sample materials, and participant handouts
- Relevance of topic
- Presenter experience

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FLORIDA SCHOOL-TO-WORK CONFERENCE
APRIL 21-23, 1996 • ORLANDO, FLORIDA

PRESENTER APPLICATION

Return to:
John Marshall, Program Chair
Florida School-to-Work Conference
School-to-Work Joint Services
325 West Gaines Street, Room 754
Tallahassee, FL 32399-0400

DIRECTIONS:
Complete this application and return by February 29, 1996. All individuals submitting proposals will be notified of the committee's decision by March 15, 1996.

LEAD PRESENTER OR PRIMARY CONTACT:

Name: ____________________

Title/Organization: ____________________

Business Address: ____________________

City: ____________________ State: __________ Zip: __________

Home Address: ____________________

City: ____________________ State: __________ Zip: __________

Daytime Telephone: ____________________ Home Telephone: ____________________

Fax: ____________________ E-mail: ____________________

ADDITIONAL PRESENTER:

Name: ____________________

Title/Organization: ____________________

ADDITIONAL PRESENTER:

Name: ____________________

Title/Organization: ____________________

TITLE OF PRESENTATION: *Write it as you would like for it to appear in the program.*

____

DESCRIPTION OF PRESENTATION: *(maximum one page) Describe hands-on activities for participants, examples of team-based activities, small group exercises, group discussion.*

____

____

____

____

____

____

____

____

____

TYPE OF PRESENTATION: *Most sessions will be set up for 80 people. Please indicate which type of session is most appropriate for your presentation.*

_____ A preconference workshop only (Sunday, April 21, 1996)

_____ Roundtable format (carousel sessions repeated several times within one time period)

_____ Clinic session (exploration/exchange of ideas in an interactive presentation)

_____ Other (panel discussion, lecture, field trip; please specify): ____________________

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LEARNER OBJECTIVES: *List 3-4 outcomes/benefits.*

____

____

____

OUTLINE OF PRESENTATION:

____

____

____

____

____

____

PRESENTERS CREDENTIALS:

____

____

____

LEVEL OF EXPERIENCE FOR PARTICIPANTS:

____ All ____ Beginner ____ Experienced

PRESENTATION STRAND: *Check all that apply.*

School-Based Learning

____ Curriculum skills and career programs of study
____ Integrated curriculum
____ Elementary standards
____ Middle school standards
____ High school standards
____ Tech Prep

Work-Based Learning

____ Work experience
____ Structured job training
____ Cooperative training
____ Worksite mentoring
____ Youth apprenticeship
____ Pre-apprenticeship
____ Apprenticeship
____ Certificates of mastery

Connecting Activities

____ Continuous Quality Improvement
____ Job-site mentors
____ Quality in the classroom
____ Team building/problem solving/goal setting
____ Training the trainers
____ Strategic planning
____ Evaluating STW programs
____ Integrating school-based and work-based learning
____ Promoting employer participation
____ Student organizations
____ Matching students with employers
____ Promoting employer participation
____ Integrating the classroom with on-the-job training
____ Building STW bridges
____ Networking employers, schools, and students
____ Linking youth activities and business and industry
____ Facilitating job placement
____ Labor market information
____ Child labor laws
____ SCANS

EQUIPMENT NEEDED:

____ VCR/Monitor
____ Easel
____ Easel pad
____ Marking pens
____ Overhead projector
____ Screen
____ High-intensity screen for LCD panel
____ Other. Please specify:
____

If you wish us to provide AV or other equipment, requests MUST be received with this application by February 29, 1996. Otherwise, you will be responsible for bringing your own.

I understand that presenters at the Florida STW Conference are required to pay for all travel and expenses.

____
SIGNATURE OF PERSON SUBMITTING APPLICATION

____
DATE

BEST COPY AVAILABLE

School-to-Work Joint Services
Florida Department of Education/
Florida Department of Labor
and Employment Services
325 West Gaines Street, Room 754
Tallahassee, FL 32399-0400

Nonprofit
Organization
US Postage
Paid
Tallahassee, FL
PERMIT NO. 55

FLORIDA SCHOOL-TO-WORK

CONFERENCE

ORLANDO, FLORIDA

APRIL 21-23

CALL FOR PRESENTERS

1996

ORANGE COUNTY
CONVENTION
CENTER

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Educational Survey

The purpose of this survey was to get feedback on education and skills standards.

This questionnaire should be completed by the individual most familiar with the Hazardous-Material Management Technician Program at your campus.

Educational Institution: ______________________________

Respondent's Name: ______________________________

Title: ______________________________

Address: ______________________________

____

City/State/Zip: ______________________________

Telephone: ______________________ **FAX:** ______________________

Internet Address: ______________________

Please check the answer that best describes your current program

What type of Hazardous-Materials Management degree or certificate do you offer? (mark all that apply)

☐ Certificate
☐ Associate Degree
☐ Other ______________________ *(Please specify)*

If you offer both certificate and degree programs, please duplicate this questionnaire so that responses can be independently evaluated.

1. List the name(s) of your certificates or degrees related to Hazardous-Materials Management.

____

____

____

2. What is the total enrollment of students in the HazMat certificate or degree program?

Full Time	Part Time
☐ less than 10	☐ less than 20
☐ 10 - 20	☐ 21 - 40
☐ 21 - 40	☐ 41 -60
☐ over 40	☐ over 60

INSTRUCTIONS

The following set of questions refers to your HazMat certificate or degree program curriculum. This questionnaire has been divided into thirteen sections based on job functions. Below each job function is a list of supporting skills and knowledge. For each job function, mark the box that best describes the level of understanding an individual would have at the completion of your program.

A scale of 1 - 5 is being used. The following definitions are provided for clarification.

1	Knowledge	Basic awareness of the concept
3		Ability to use concept in a practical situation
5	Mastery	A thorough understanding and ability to apply a concept in a variety of situations

Then check the information that is part of your curriculum that helps meet this job function.

NATIONAL VOLUNTARY SKILL STANDARD ANALYSIS
Hazardous-Materials Management Technology

Knowledge				Mastery	
1	2	3	4	5	**1. Evaluate hazardous-materials and hazardous-waste sample data.**
					Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A Perform mathematical calculations following existing formulas and reference materials
1	2	3	4	5	B Read and interpret blueprints, charts, curves, graphs, maps, plans, and spreadsheets from plotted and tabulated data
1	2	3	4	5	C Collect, tabulate, and assist in the evaluation of data, using appropriate techniques and technology such as: calculators, computers, databases, graphics, and spreadsheets
1	2	3	4	5	D Check laboratory and/or field sample analyses by comparing to regulatory limits

Knowledge				Mastery	
1	2	3	4	5	**2. Safely handle hazardous-materials and hazardous-wastes.**
					Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A Use chemical reference materials to obtain information on proper chemical handling
1	2	3	4	5	B Recognize, apply, and respond appropriately to chemical-hazard information
1	2	3	4	5	C Direct personnel in the proper handling and control of hazardous-materials and hazardous-wastes
1	2	3	4	5	D Identify and implement safe ergonomic controls and procedures
1	2	3	4	5	E Demonstrate safe handling procedures for chemical containers such as: bulk containers, drums, portable and stationary tanks
1	2	3	4	5	F Identify and respond to emergencies, alarms, and abnormal situations in accordance with written procedures
1	2	3	4	5	G Identify and implement safe chemical-handling procedures such as: bonding, fire control, grounding, storage, vapor control, and ventilation
1	2	3	4	5	H Provide on-the-job training as required

Knowledge				Mastery	
1	2	3	4	5	**3. Respond to hazardous-materials and hazardous-waste emergency situations in accordance with regulatory requirements.**
					Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A Perform as a team member on an emergency-response team
1	2	3	4	5	B Ensure that adequate spill-control equipment and supplies are available at all times
1	2	3	4	5	C Develop and implement an emergency-response program
1	2	3	4	5	D Demonstrate competency and maintain certification in first aid and cardio-pulmonary resuscitation
1	2	3	4	5	E Follow guidelines for controlling leaks from containers
1	2	3	4	5	F Consider environmental consequences of emergency situations and respond appropriately

NATIONAL VOLUNTARY SKILLS STANDARD ANALYSIS

Hazardous-Materials Management Technology

Knowledge				Mastery	
1	2	3	4	5	**4. Operate equipment related to hazardous-materials and hazardous-waste operations.**
					Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A Identify and describe the safe and proper use of equipment such as: drum crushers, hand tools, heavy equipment, monitoring and sampling equipment and instrumentation, motorized lifting devises, power tools, pumps, valves, and meters
1	2	3	4	5	B Identify, describe, and use appropriate equipment-decontamination procedures
1	2	3	4	5	C Identify, describe, and use appropriate operations and maintenance procedures, plans, and manuals
1	2	3	4	5	D Identify, describe, and use appropriate health and safety equipment such as: communication systems, eyewash and safety showers, fire extinguishers, vehicles, equipment, first aid
Knowledge				Mastery	
1	2	3	4	5	**5. Identify and label hazardous-materials and hazardous waste in accordance with regulatory requirements.**
					Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A Identify, characterize, and label hazardous-materials by chemical and physical properties, such as: color, corrosivity, density, flammability, reactivity, specific gravity, toxicity, and viscosity
1	2	3	4	5	B Identify and characterize hazardous-wastes according to regulatory standards such as: acute toxicity, corrosivity, ignitability, reactivity, and toxic characteristic leachate procedure (TCLP)
1	2	3	4	5	C Provide proper labeling for hazardous-wastes
1	2	3	4	5	D Use chemical reference materials to obtain identification and labeling information
1	2	3	4	5	E Check for correct labels and Material Safety Data Sheets (MSDSs) when shipment is required
1	2	3	4	5	F Label containers of repackaged materials with appropriate warnings and expiration information
1	2	3	4	5	G Direct personnel in the proper identification and labeling of hazardous-materials

NATIONAL VOLUNTARY SKILLS STANDARD ANALYSIS

Hazardous-Materials Management Technology

Knowledge				Mastery		
1	2	3	4	5		**6. Calibrate, operate, and maintain instrumentation.**
						Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A	Operate, record, and evaluate meter- and gauge-reading trends and implement appropriate actions
1	2	3	4	5	B	Perform routine maintenance of equipment and instrumentation
1	2	3	4	5	C	Operate gauges, meters, and monitoring and sampling instrumentation
1	2	3	4	5	D	Calibrate and operate field and laboratory instrumentation such as: air-monitoring instrumentation, groundwater-monitoring instrumentation, soil-monitoring instrumentation, solid-waste-monitoring instrumentation, and surface-water-monitoring instrumentation
1	2	3	4	5	E	Identify the need for and comply with factory calibration
1	2	3	4	5	F	Describe the difference between fluid and factory calibration and demonstrate their appropriate use

Knowledge				Mastery		
1	2	3	4	5		**7. Compile, record, and maintain required documents for hazardous-materials and hazardous-waste management activities.**
						Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A	Compile and maintain a hazardous-materials inventory
1	2	3	4	5	B	Compile and maintain documentation of hazardous-materials, such as: chain of custody, equipment calibration and maintenance, exception reports, field notebooks, incident documentation, laboratory data, manifests, MSDS, purchase orders, shipping documents, and vendor invoices
1	2	3	4	5	C	Compile and maintain records to prepare compliance reports
1	2	3	4	5	D	Ensure current MSDSs are available in the workplace
1	2	3	4	5	E	Operate and maintain auditable record-keeping systems in accordance with regulatory requirements
1	2	3	4	5	F	Conduct and maintain a hazardous-waste inventory
1	2	3	4	5	G	Communicate with suppliers to obtain product identification and labeling
1	2	3	4	5	H	Identify and maintain an inventory of empty and full containers
1	2	3	4	5	I	Compile and maintain personal health and safety records
1	2	3	4	5	J	Read and interpret blueprints, flow diagrams, and schematics

NATIONAL VOLUNTARY SKILLS STANDARD ANALYSIS
Hazardous-Materials Management Technology

Knowledge				Mastery		
1	2	3	4	5		**8. Implement procedures to comply with appropriate regulations.**
						Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A	Read and apply regulatory standards to ensure compliance in operations
1	2	3	4	5	B	Obtain hazardous-materials and hazardous-waste permits and/or approvals
1	2	3	4	5	C	Describe the regulatory process, from the introduction of a bill to the promulgation of a regulation
1	2	3	4	5	D	Identify and describe the penalties for noncompliance
1	2	3	4	5	E	Differentiate between federal, state, and local hazardous-materials and hazardous-waste regulations and identify appropriate regulatory agencies
1	2	3	4	5	F	Identify regulatory changes and the impact they have on an operation
1	2	3	4	5	G	Comply with federal, state, and local hazardous-materials regulations
1	2	3	4	5	H	Conduct audits and inspections to ensure hazardous-waste management activities are in compliance with federal, state, and local regulations
1	2	3	4	5	I	Follow written, company-standard operating procedures
1	2	3	4	5	J	Comply with federal, state, and local health and safety regulations
1	2	3	4	5	K	Identify sources of current or timely regulatory information

Knowledge				Mastery		
1	2	3	4	5		**9. Implement applicable safety regulations and procedures.**
						Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A	Demonstrate safe health and work habits
1	2	3	4	5	B	Read and implement other regulatory standards and guidance relative to worker safety and health such as: blood-borne pathogens, confined space, emergency egress, fire safety, hearing conservation, and lockout/tagout
1	2	3	4	5	C	Identify and describe unsafe workplace and job conditions and implement corrective actions

NATIONAL VOLUNTARY SKILLS STANDARD ANALYSIS
Hazardous-Materials Management Technology

Knowledge				Mastery	
1	2	3	4	5	**10. Select and use appropriate personal protective equipment and respiratory protection.** *Please mark all the following supporting information included in your curriculum to meet this job function*
1	2	3	4	5	A Use and interpret chemical reference materials in the selection of appropriate personal protective equipment (PPE) and respirators
1	2	3	4	5	B Communicate with suppliers and manufacturers to obtain personal protective and respiratory equipment information
1	2	3	4	5	C Identify, describe, and use PPE appropriate to the work conditions
1	2	3	4	5	D Identify and describe the elements of respiratory protection and PPE plans
1	2	3	4	5	E Identify, describe, and use respiratory protection appropriate to the work conditions
1	2	3	4	5	F Identify and describe hazards associated with the use and limitations of PPE and respiratory protection
1	2	3	4	5	G Maintain and inspect PPE and respiratory protection systems according to regulations

Knowledge				Mastery	
1	2	3	4	5	**11. Collect, prepare, document, and ship samples for analysis.** *Please mark all the following supporting information included in your curriculum to meet this job function*
1	2	3	4	5	A Perform and document sampling for hazardous-waste characterization purposes
1	2	3	4	5	B Perform field tests according to instructions and procedures
1	2	3	4	5	C Calibrate and operate, as required, field-test equipment such as: air-monitoring equipment, bailers, hand augers, organic-vapor analyzers, pumps, radioactivity measuring equipment, and split spoons
1	2	3	4	5	D In accordance with instructions and/or procedure, collect samples such as: air and soil, bulk materials, groundwater, solid wastes, and surface water
1	2	3	4	5	E Identify and demonstrate an ability to adjust procedures appropriately for potential sample interferences
1	2	3	4	5	F Decontaminate equipment in accordance with quality-control/quality-assurance procedures
1	2	3	4	5	G Identify and describe the appropriate use, limitations, and applications of sampling equipment such as: colorimetric indicator, combustible-gas indicator, and organic-vapor analyzer
1	2	3	4	5	H Perform personnel-exposure monitoring in accordance with appropriate standards such as: noise monitoring, oxygen monitoring, radiation dosimetry, temperature extremes, and Threshold Limit Value-Biological Exposure indices
1	2	3	4	5	I Prepare and ship samples to laboratory

Knowledge				Mastery		
1	2	3	4	5		**12. Transport and store hazardous-materials and hazardous waste in accordance with applicable regulations.**
						Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A	Monitor documentation related to the shipment of hazardous-materials and hazardous-wastes
1	2	3	4	5	B	Identify incompatible combinations of chemicals that could result in dangerous situations
1	2	3	4	5	C	Label containers with appropriate identification and expiration information
1	2	3	4	5	D	Safely package, load, document, and ship hazardous-materials and hazardous-wastes in compliance with appropriate regulations
1	2	3	4	5	E	Inspect hazardous-waste storage areas for compliance with appropriate rules and regulations
1	2	3	4	5	F	Properly segregate and store incompatible hazardous-materials and hazardous-wastes

Knowledge				Mastery		
1	2	3	4	5		**13. Operate hazardous-materials and hazardous-waste treatment and disposal systems.**
						Please mark all the following supporting information included in your curriculum to meet this job function
1	2	3	4	5	A	Record and maintain documentation of operations activities
1	2	3	4	5	B	Follow appropriate plans such as: assessment plan, health and safety plan, initial sampling plan, remediation plan, risk-assessment plan, site-closure plan, standard operating procedures, waste-minimization plan
1	2	3	4	5	C	Assist and contribute to the development and revision of plans and reports such as: assessment plan, health and safety plan, initial sampling plan, remediation plan, risk-assessment plan, site-closure plan, standard operating procedures, waste-minimization plan
1	2	3	4	5	D	Prepare and maintain hazardous-waste manifests and associated documents for inspection
1	2	3	4	5	E	Select appropriate drums and containers
1	2	3	4	5	F	Implement good housekeeping practices in the workplace
1	2	3	4	5	G	Check and document activities of hazardous-waste treatment and disposal contractors
1	2	3	4	5	H	Working individually or with others, develop improvements in the reduction, reuse, recycling, or disposal of waste streams
1	2	3	4	5	I	Coordinate collection and disposal of empty containers
1	2	3	4	5	J	Prepare accumulated hazardous waste for proper disposal
1	2	3	4	5	K	Identify and describe treatment, removal, and disposal systems such as: bio-remediation, chemical and physical, deep-well injection, incineration, vitrification, volatile organic compounds
1	2	3	4	5	L	Identify and describe hazards associated with abatement of materials such as: asbestos, fiberglass, lead, and others
1	2	3	4	5	M	Identify and describe hazards associated with treatment, removal, and disposal systems and operations
1	2	3	4	5	N	Provide on-the-job training as required

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Hazardous Material Management Technology Skills Standard Project Evaluation from Industry and Business Representatives Questionnaire

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2. Will these standards be referred to or attached to the Hazardous Materials Manual at your organization? If so please explain.

3. Will these standards be used as a baseline skill requirement for entry-level personnel working as a Hazardous Materials Management Technician? If so please explain.

4. Will these standards be used to evaluate existing personnel for performance related to Hazardous Materials Management? If so please explain.

5. Will these standards be used in the development of company specific training programs? If so please explain.

Hazardous Materials Management Technology
Third-Party Evaluation Skill Standard
Phase Two Final Report

Project Funded by a Grant From
The United States Department of Education
Grant No. V244B30010

Prepared By

Jean Drevdahl

October 1996

Overview

The development of an Occupational Skills Standard for Hazardous Materials Management Technology (HMMT) was funded by a grant from the U.S. Department of Education and managed by the Center for Occupational Research and Development (CORD) in Waco, Texas. During the second phase of this grant, four goals were identified. The first goal was to validate the skill standard by developing two surveys. One survey targeted industries that employ HMMT's. The other survey focused on community colleges with hazardous materials programs. The college survey was designed to determine if the curriculum used in these programs covered the job functions listed in the skill standard. The second project goal was to disseminate the skill standard to those individuals who might find it useful, for example, A third goal was to evaluate the possibility of creating a certification program for students and an accrediting process academic programs. The fourth goal was to evaluate the feasibility of creating curriculum material to be used in the HMMT programs.

Report Summary

The development of an occupational skills standard for Hazardous Materials Management Technology (HMMT) was funded by a grant from the U.S. Department of Education and managed by the Center for Occupational Research and Development (CORD) in Waco, Texas.

There were four major goals completed during phase two of this grant. The first goal was to validate the skill standard by developing two surveys: one for industry and one for educational institutions. The industry survey evaluated industries that employ HMMTs. In addition, a survey was created to determine if the Partnership for Environmental Technology Education (PETE) schools are teaching the job functions listed in the Skills Standard.

The second goal for this project was to disseminate the standard to those individuals who find it useful. This was done by providing a complimentary copy of the standard to PETE colleges when they receive the academic survey to complete. Then, the results from phase one and phase two were distributed at different professional conferences and PETE regional meetings. Industry was able to obtain a copy of the skill standard from CORD.

A third goal of phase two was to evaluate the possibility of creating a certification program for students who complete a degree or certificate in HMMT. The certification subcommittee, chaired by Rick Richardson of the National Environmental Training Association (NETA), looked into the possibility of accrediting individual HazMat programs at colleges and technical schools. The purpose of the accreditation program is to recognize the educational providers as meeting standards and criteria established by a peer group.

A fourth objective was to look at the feasibility of creating curriculum material to be used in HMMT programs.. Gayle Bowles-Haecker of CORD was working on developing real-world scenarios that could be used by the schools to bring in a realistic approach to the HMMT curriculum. The PETE organization is working with IN-TELE-COM on a project called "Preserving the Legacy" to develop community college-level textbooks and training materials for use in the environmental management area. Howard Guyer, an advisory committee member and a Western PETE member, chaired the development of the textbooks.

This report documents the progress of the goals originally identified for this grant. The goals are listed in bold with supporting documentation following.

Goal 1: Validation of the Skills Standard by developing an industry-based and educational survey

To validate and refine the content of the HMMT standard, two surveys were developed and distributed; one survey was mailed to industry and one to educational institutions. The industry survey was developed by Robert Bear, P.E., Chair of the HMMT skill standard advisory committee. Bear used the 13 job functions listed in the standard and surveyed the industrial population who employed HMMTs to evaluate the importance and frequency of each job function outlined in the standard, according to the needs of HMMT technicians working in industry.

The industry survey was mailed out by NETA who sent out approximately 5,000 industrial surveys to environmental managers listed in a Litton database. Five hundred of these surveys went to members of the National Association of Environmental Professionals (NAEP). A total of 373 completed surveys were received by the April 30, 1995 deadline. Gayle Bowles-Haecker conducted the analysis on this data and subsequent conclusions were presented at the final meeting of this grant held in Orlando, Florida, in January 1996.

The academic survey was chaired by Jean Drevdahl. The main objective of the survey was to determine if schools with HMMT programs cover the 13 job functions as described in the skill standard as part of their curriculum. The survey, which listed job functions and supporting job tasks and knowledge areas, asked that respondents rate these items on a Likert scale with a one (1) indicating the student would have a basic knowledge of this task to a five (5) representing the student had mastered this particular skill when they completed their program. Two hundred-forty surveys were mailed to PETE schools that had any components of a HMMT program. Only fourteen schools responded. Therefore, the focus was narrowed to the seventy-eight PETE schools with HMMT programs. Those surveys were mailed out the last week in August with a due date of September 30, 1995.

Each PETE school that did not return the survey was called to try to increase the rate of return. During the phone calls, it was determined if the school received the survey. If the person working with the program had not received one, a new one was mailed. Twelve of the schools contacted requested another copy of the survey and they were mailed out with a November 15, 1995 due date. Messages reminding the contact to complete the survey were left on voice mail. If they needed another copy of the survey, they were asked to contact Jean Drevdahl. After calling the schools, Drevdahl provided data input and analysis, which took more time than identified in the proposed time line.

In the educational survey, the following hypotheses were developed and tested:

Ho1: There is a common program title for the hazmat related programs at PETE colleges.

Ho2: There is no significant difference in the student make up (full-time vs part-time) of the three types of educational programs: certificate and degree, degree only, and certificate only.

Ho3: PETE schools teach all the job functions in the HMMT skill standard to at least an average level of understanding, based on receiving a rating of three on a one to five Likert scale.

Ho4: There is no significant difference in the reported level of understanding for the graduates of each type of educational program: certificate and degree, degree only, and certificate only.

Analyzing the results from Ho1 indicated the most common certificate or degree title was related to environmental technology.

The results from Ho2 indicate there appears to be a difference in the student make up with respect to the number of full-time and part-time students in degree or certificate programs. In colleges that offered a degree program, it appears there are more full-time than part-time students enrolled in the program. Responses showed It appears a certificate program is geared toward those individuals who are not full-time students, but working to complete their certificate on a part-time basis.

Results of data from Ho3 indicate that all 13 job functions were taught above the hypothesized level of three on a one to five Likert scale. A level of three corresponded to the students having practical knowledge of all components of the skill standard.

Data analysis on Ho4 indicated that overall, there is no difference in the level of understanding that a graduate of a PETE hazmat program would have at the completion of his/her program regardless of the type of program he/she attended (certificate and degree, degree only, or certificate only). A Chi Square statistic was used to determine if the three groups had the same level of understanding. When the Chi Square indicated a difference in the programs, a Kruskal-Wallis ANOVA was calculated. Based on the Chi Square, job function five of the skill standard was rejected at an alpha level of .05. When the Kruskal-Wallis was run, it was concluded there were differences in the expected level of understanding upon graduation from the three programs with respect to this one job function. The difference in the programs occurred between the combined certificate and degree programs with the degree-only programs.

It appears that with the exception of job function five, there is no significant difference in the level of understanding about all job functions in the skill standard for any of the three types of educational programs at PETE schools. This would indicate that the core components of a hazmat program are covered in a certificate program. The additional courses are required for an associate degree appear to be unrelated to the competencies identified on the skill standard.

It appear the graduates of PETE hazardous materials programs are well prepared to accomplish the items identified in the skill standard.

Goal 2: Disseminate the draft standards to the educational community and to professionals in the field of Hazardous Materials Management

Jim Johnson and Robert Bear, P.E., wrote an article about the Skills Standard that appeared in the Journal of the National Environmental Health Association. This provided an excellent opportunity to distribute information about the new Skills Standard to individuals who are involved in the Hazardous Materials and Environmental professionals.

Three HMMT skill standards dissemination meetings were held at the following locations: Waco, Texas, October 3-4, 1994; Gainesville, Florida, April 27-28, 1995; and Washington, D.C., June 14, 1995. Advisory committee members were able to obtain a copy of a presentation developed by Gayle Bowles-Haecker that covered the progress of the HMMT skill standard grant to date and presented the results at seminars and conferences they were attending. This was a very effective way to increase participation of committee members, distribute information, and minimize financial impact on the grant. The location of the presentations given by the committee members included the following:

1995	Location	Organization
Jan 20-21	Raleigh, NC	SE PETE
Jan 26-27	Charleston, SC	EPA Seminars
Mar 3-4	Washington, DC	Critical Issues
Mar 20-21	Cedar Rapids, IA	NC PETE
Apr 3-5	Austin, TX	P2 Roundtable
May 4-5	Portland, OR	NW PETE
May 22-23	Berkley, WV	DoE/IUOE
Jun 19	Cedar Rapids, IA	Fellows Meeting
Jul 14	Orlando, FL	Southern Regional Education Board

To increase the distribution of the skill standard, 2007 documents were mailed to companies, departments of education, individuals, trade and professional organizations, publications, and two- and four-year colleges. The distribution was tracked to correlate with the PETE regions. The results showed Northwest PETE received 485 copies of the standard, North Central PETE received 282 copies, Northeast PETE received 325 copies, Western PETE received 59 copies, Central PETE received 377 copies, and Southeast PETE received 152 copies.

Thirty-eight percent of the total Skills Standards were mailed out to 2-year colleges, 26 percent went to companies, 13percent went to Departments of Education, 12 percent went to an undefined group, and 11 percent went to trade and professional organizations, four-year colleges, and individuals.

Goal 3: Determine requirements for certification of Hazardous Materials technicians necessary to be employable in their field

A task force was assembled with the goal of determining the requirements for individual certification and educational program accreditation. Rich Richardson of National Environmental Training Association (NETA); Reggie Moore of the National Environmental Health Association (NEHA); Susan Drew Thomas of the National Association of Environmental Professionals (NEPA); and Doug Feil of Kirkwood Community College representing PETE, established a plan and time line to complete this goal.

The certification group met on July 28, 1995 in Reno, Nevada, to develop criteria for individual certification of HMMTs and accreditation of academic training programs. The group defined certification as the recognition of demonstrated competency of an HMM technician. Accreditation was defined as the recognition of a program that meets standards and criteria established by a peer group. Additionally, some of the key elements of a successful certification program as defined by this group included:

1. Customer buy-in (employers, trades, and professional organizations),
2. Certification must be voluntary,
3. Certification will include an ongoing evaluation and assessment of the program elements,
4. Certification program will be validated by peer review,
5. Certification must be composed of a written and practical component, and
6. Programs must be exportable and duplicated with appropriate modifications, for use elsewhere.

At this meeting a tentative model was discussed for the certification and accreditation programs.

Goal 4: Develop a curriculum framework and guide that integrates and includes the standards as well as necessary academics for materials in the sciences supporting Hazardous Materials Management Programs

Jim Johnson and Gayle Bowles-Haecker, CORD; Steve Fenton, Scott Community College; and Doug Feil of Kirkwood Community College worked to develop definitions, competencies, and curriculum guidelines for the HMMT skill standard. During the July 29, 1995 meeting the outcomes were reviewed. They included clarifying the level of competency expected of the HMMT upon completing a training program. The second outcome was to develop a potential career path beginning in middle school and continuing through high school and junior college. The third outcome was to define a training curriculum for individuals who are unemployed by using the Tech Prep Bridge program available at many community colleges. The final outcome was to develop an understanding of the connection between compliance-based training and the standard. Bowles-Haecker worked with this group to ensure the outcomes were completed by the January 1996 meeting.

Conclusions

The industrial survey and academic surveys were completed and results were tabulated. The certification and accreditation components are not complete. They were not ready final recommendation at the January 1996 meeting. During phase two, scenarios were developed. Some curriculum materials to be used in HMMT programs have been developed, as well.

Questionnaire (12/95)

This questionnaire was completed by calling business/industry representatives who received a complimentary copy of the skills standard document. The outcomes provided the advisory committee members with information about the credentials for which potential employees were looking.

Hazardous Material Management Technology Skills Standard Project Evaluation from Industry and Business Representatives Questionnaire

1. Will these standards be incorporated into job descriptions for Hazardous Materials Management Technicians at your organization? If so please explain.

2. Will these standards be referred to or attached to the Hazardous Materials Manual at your organization? If so please explain.

3. Will these standards be used as a baseline skill requirement for entry-level personnel working as a Hazardous Materials Management Technician? If so please explain.

4. Will these standards be used to evaluate existing personnel for performance related to Hazardous Materials Management? If so please explain.

5. Will these standards be used in the development of company specific training programs? If so please explain.

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6. If you knew that these standards were incorporated into an Associate Degree curriculum at a local community or technical college, would you give priority to the graduates applying for Hazardous Materials Management Technicians?

7. What type of evidence (credential) would you consider most important to verify that a potential employee possessed the skills described in the standard? Please explain your response.

   ☐ Certificate of Competency (verifying that a person possessed the skills) given by a testing agency

   ☐ Associate Degree in Hazardous Materials Management from ***any*** community college

   ☐ Associate Degree in Hazardous Materials Management from a community college that has been accredited by a peer review process.

   ☐ Resume only

   ☐ Certification (given by a professional organization with participation voluntary)

   ☐ State License

CORD and the Department of Education appreciates your time spent completing this questionnaire. To account for the donation of time spent on the Hazardous Material Management Technology Skills Standard Project, please tell us how much time you needed to complete this questionnaire.

Hours/Minutes ______________________________

Date: ______________________________

Signature: ______________________________

Company: ______________________________

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ghaecker/12-5-95
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A summary of questionnaires sent to HMMT SS Interest Group-Companies

Hazardous Material Management Technology Skills Standard Project Evaluation from Industry and Business Representatives Questionnaire

13 responses from industry members.

1. Will these standards be incorporated into job descriptions for Hazardous Materials Management Technicians at your organization? If so please explain.

   10 indicated yes. Most indicated that the skills standard or elements of it would be incorporated into the development of new job descriptions. A couple responses indicated a lack of an "official HMMT position", within their company.

2. Will these standards be referred to or attached to the Hazardous Materials Manual at your organization? If so please explain.

   5 indicated qualified yes to this question. Some indicated the lack of a "manual", but most indicated the Standard would be implemented through job descriptions or as a reference document for human resources.

3. Will these standards be used as a baseline skill requirement for entry-level personnel working as a Hazardous Materials Management Technician? If so please explain.

   Most indicated yes, as a baseline for new hires or entry level employees. A couple indicated using the Standard to shape retraining programs for employees.

4. Will these standards be used to evaluate existing personnel for performance related to Hazardous Materials Management? If so please explain.

   A few indicated a definite yes to this question. Several indicated that it would be used to evaluate training needs or programs. Some indicated that it would take some time before this type of evaluation could be implemented.

5. Will these standards be used in the development of company specific training programs? If so please explain.

   Except for one respondent, all said that the standard, or parts of it, is being used to guide training and employee development programs. The individual that answered "no", indicated that regulations drive training program requirements.

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6. If you knew that these standards were incorporated into an Associate Degree curriculum at a local community or technical college, would you give priority to the graduates applying for Hazardous Materials Management Technicians?

   All respondents indicated that this would provide an applicant a definite advantage over others.

7. Wha type of evidence (credential) would you consider most important to verify that a potential employee possessed the skills described in the standard? Please explain your response.

   - ☐ Certificate of Competency (verifying that a person possessed the skills) given by a testing agency *7 responses*
   - ☐ Associate Degree in Hazardous Materials Management from *any* community college *0 responses*
   - ☐ Associate Degree in Hazardous Materials Management from a community college that has been accredited by a peer review process. *9 responses*
   - ☐ Resume only *0 responses*
   - ☐ Certification (given by a professional organization with participation voluntary) *5 responses*
   - ☐ State License *2 response*

Several respondents checked more than one of these, as well as "qualified" their answers. Some of the comments include:

Certification or graduation do not guarantee competence.
Credential required would depend on the responsibility level of the job involved.
Certificate of Competency is the quickest way to verify skills.
Personnel desires education+experience+certification.
Acceptable evidence of skill level/qualification would be contingent upon are understanding of the credentialling process and requirements.
A state license is very necessary. We are being fought by civil engineers and the preconceived thought about dollers. You have to have a license to cut hair, but you can handle hazardous materials without one.
It might be better to have a broader scope such as environmental technology.

Level of Profession Chart (1/96)

This chart was created and reviewed at the last advisory committee meeting. The purpose of the meeting was to have committee members discuss how to better define the knowledge needed to perform at the master, associate, or compliance level.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Evaluate hazardous materials and hazardous waste sample data.				
Perform mathematical calculations following existing formulas and reference materials	Perform calculations using formulas and reference materials *from memory*.	*Determine* appropriate formula and reference materials and perform calculations using this information	Perform calculations using a *given* formula and reference materials	Not covered
Read and interpret blueprints, charts, curves, graphs, maps, plans, and spreadsheets from plotted and tabulated data	*Interpret* blueprints, charts, etc.	*Read and gather data* from blueprints, charts, etc.	*Read and gather data* from blueprints, charts, etc.	Not covered
Collect, tabulate, and assist in the evaluation of data, using appropriate techniques and technology such as: calculators, computers, databases, graphics, spreadsheets	*Evaluate* data, using appropriate techniques and technology...	*Tabulate and assist* in the evaluation of data, using appropriate techniques...	*Collect data*, using appropriate techniques and technology...	Not covered
Check laboratory and/or field sample analyses by comparing to regulatory limits	*Make decisions* based on lab and/or analyses as compared to regulatory limits	*Compare* lab and/or analyses to regulatory limits.	*Compare* lab and/or analyses to regulatory limits.	*Identify reference material* that consists regulatory limits.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Safely handle hazardous materials and hazardous wastes.				
Use chemical reference materials to obtain information on proper chemical handling	*Define* proper chemical handling procedures, based on knowledge of reference materials	Use chemical reference materials to *obtain information* on proper chemical handling	*Identify* reference materials containing chemical handling information	*Identify* reference materials containing chemical handling information
Recognize, apply, and respond appropriately to chemical hazard information	*Apply* chemical hazard information to situations, solutions, and actions.	*Identify and respond* appropriately to chemical-hazard information	*Identify and respond, according* to instructions, to chemical hazard information	*Identify* chemical hazard information
Direct personnel in the proper handling and control of hazardous materials and hazardous wastes	*Direct personnel* in the proper handling and control of hazardous materials and wastes	*Serve as a contact person* for information regarding proper handling and control of h.m. and h.w.	*Possess information* regarding proper handling and control of h.m. and h.w.	*Identify* proper handling and control of h.m. and h.w.
Identify and implement safe ergonomic controls and procedures	*Implement* procedures for safe ergonomic controls and practices	*Identify and use* safe ergonomic controls and procedures	*Identify and use* safe ergonomic controls and procedures	Not covered

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Demonstrate safe handling procedures for chemical containers such as: bulk containers, drums, portable and stationary tanks	*Demonstrate* safe handling procedures for chemical...	*Demonstrate* safe handling procedures for chemical...	*Demonstrate* safe handling procedures for chemical...	*Identify* safe handling procedures...
Identify and respond to emergencies, alarms, and abnormal situations in accordance with written procedures	*Assist in the development* of written procedures for emergencies, alarms, and abnormal situations	*Identify and respond* to emergencies, alarms, and abnormal situations, according to written procedures	*Identify and respond* to emergencies, alarms, and abnormal situations, according to written procedures	*Identify* common procedures for emergencies, alarms, and abnormal situations
Identify and implement safe chemical-handling procedures such as: bonding, fire control, grounding, storage, vapor control, ventilation	*Perform* safe chemical-handling procedures...	*Perform* safe chemical-handling procedures...	*Identify* safe chemical-handling procedures...	*Identify* safe chemical-handling procedures...
Provide on the job training as required	*Provide* on-the-job *training* as required	*Assist in the development* of training programs to meet regulatory and company needs	*Identify training requirements* set forth by regulations.	*Identify training requirements* set forth by regulations.

HAZARDOUS MATERIALS-MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Respond to hazardous-materials and hazardous-waste emergency situations in accordance with regulatory requirements.				
Perform as a team member on an emergency-response team	*Develop and direct* emergency response team.* **requires appropriate regulatory training*	*Perform as a team* member on an emergency-response team, knowing compliance information	*Perform as a team* member on an emergency-response team, knowing compliance information	Identify the members of an emergency response team and their respective qualifications and accountability as dictated by regulations
Ensure that adequate spill-control equipment and supplies are available at all times	*Maintain* adequate spill-control equipment and supplies on site.	*Maintain* adequate spill-control equipment and supplies on site.	*Inventory* spill-control equipment and supplies on site and advise appropriate personnel	Identify appropriate spill control equipment and supplies
Develop and implement an emergency-response program	*Implement* an emergency-response program	*Develop* an emergency response program	*Identify* the components of an emergency response program	Identify the components of an emergency response plan according to regulations

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Demonstrate competency and maintain certification in first aid and C.P.R.	Maintain certification in first aid and C.P.R.	Maintain certification in first aid and C.P.R.	Maintain certification in first aid and C.P.R.	CPR and First Aid courses
Follow guidelines for controlling leaks from containers	*Inspect and exercise preventive* maintenance of containers.	*Control* leaks from containers appropriately	*Control* leaks from containers *according to instructions and guidelines*	*Identify guidelines* for controlling leaks from containers.
Consider environmental consequences of emergency situations and respond approriately	*Understand environmental consequences* of emergency situations and respond appropriately	*Consider possiable environmental consequences* of emergency situations and respond appropriately	*Identify environmental consequences* of various emergency situations.	Identify appropriate responses to emergency situations based on potential environmental consequences.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Operate equipment related to hazardous materials and hazardous-waste operations.				
Identify and describe the safe and proper use of equipment such as: drum crushers, hand tools, heavy equipment, monitoring and sampling equipment and instrumentation, motorized lifting devices, power tools, pumps, valves, and meters	*Implement* procedures for safe and proper use of equipment...	*Identify, describe, and perform* safe and proper use of equipment...	*Identify and describe* the safe and proper use of equipment...	Not covered
Identify, describe, and use appropriate equipment-decontamination procedures	*Perform and direct* appropriate equipment-decontamination procedures	*Identify, describe and use* appropriate equipment-decontamination procedures	*Identify and describe* appropriate equipment-decontamination procedures	Identify requirements for decontaminating equipment
Identify, describe, and use appropriate operations and maintenance procedures, plans, and manuals	*Develop and implement* appropriate operations and maintainance...	*Identify, describe, and use* appropriate operations and maintenance...	*Identify and describe* appropriate operations and maintenance...	Not covered
Identify, describe, and use appropriate health and safety equipment such as: communication systems, eyewashes and safety showers, fire extinguishers, vehicles, and equipment, first aid	*Direct personnel* in the use of appropriate health and safety...	*Identify, describe, and use* appropriate health and safety equipment...	*Identify, describe, and use* appropriate health and safety equipment...	Identify health and safety equipment such as...

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Identify and label hazardous materials and hazardous waste in accordance with regulatory requirements.				
Identify, characterize, and label hazardous materials by chemical and physical properties, such as: color corrosivity, density, flammability, reactivity, specific gravity, toxicity, viscosity	Identify, characterize, and label h.m. by chemical, and...	Identify, characterize, and label h.m. by chemical, and...	Identify, characterize, and label h.m. by chemical, and...	Not covered
Identify and characterize hazardous wastes according to regulatory standards such as: acute toxicity, corrosivity, ignitability, reactivity, and toxic characteristic leachate procedure (TCLP)	Identify and characterize h.w. according to regulatory standards...	Identify and characterize h.w. according to regulatory standards...	Identify and characterize h.w. according to regulatory standards...	Identify the regulatory standards for acute toxicity, corrosivity, ignitability...
Provide proper labeling for hazardous wastes	Provide proper labeling for h.w.	Provide proper labeling for h.w.	Provide proper labeling for h.w.	Provide proper labeling for h.w.
Use chemical reference materials to obtain identification and labeling information	Use chemical reference materials to obtain ...	Use chemical reference materials to obtain ...	Use chemical reference materials to obtain ...	Identify chemical reference material for h.m. information.
Check for correct labels and Material Safety Data Sheets (MSDS) when shipment is received	Check for correct labels and MSDS upon receipt of materials and *take action as necessary*.	Check for correct labels and MSDS upon receipt of materials.	Check for correct labels and MSDS upon receipt of materials.	Identify shipping document requirements, including MSDS.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Label containers of repackaged materials with appropriate warnings and expiration information	Label containers of repackaged materials with appropriate...	Label containers of repackaged materials with appropriate...	Label containers of repackaged materials with appropriate...	Identify labeling requirements of repackaged materials.
Direct personnel in the proper identification and labeling of hazardous materials	*Direct personnel* in the proper id and labeling of h.m.	*Serve as a contact person* for proper id and labeling of h.m.	*Possess information* for proper id and label of h.m.	Identify requirements for proper id and label...
Calibrate, operate, and maintain instrumentation.				
Operate, record, and evaluate meter- and gauge-reading trends and implement appropriate actions	*Operate, record, and evaluate* meter- and gauge-reading trends and implement appropriate actions	*Operate, record, and evaluate* meter- and gauge-reading trends	*Operate and record* meter- and gauge-reading trends.	Not covered
Perform routine maintenance of equipment and instrumentation	Perform routine maintenance of equipment and instrumentation	Perform routine maintenance of equipment and instrumentation	Perform routine maintenance of equipment and instrumentation	Not covered

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Operate gauges, meters, and monitoring and sampling instrumentation	Operate gauges, meters, and monitoring and sampling instrumentation	Operate gauges, meters, and monitoring and sampling instrumentation	Operate gauges, meters, and monitoring and sampling instrumentation	Not covered
Calibrate and operate field and laboratory instrumentation such as: air-monitoring instrumentation, groundwater-monitoring instrumentation, soil-monitoring instrumention, surface water-monitoring instrumentation	*Calibrate and operate* field and laboratory instrumentation...	*Operate* field and laboratory instrumentation... and calibrate *according to written instructions*	*Operate* field and laboratory instrumentation...	Not covered
Identify the need for and comply with factory calibration	***Identify the need for and take appropriate action*** to comply with factory calibration	Identify the need for instrument calibration and take action *according to written instructions*	Identify the need for instrument calibration and take action *according to written instructions*	Not covered
Describe the difference between fluid and factory calibration and demonstrate their appropratie use	*Determine and use* appropriate fluid and factory calibration techniques depending on situation.	*Describe* the difference between fluid and factory calibration and demonstrate appropriate use for varying situations.	*Describe* the difference between fluid and factory calibration and their respective uses in varying situations.	Not covered

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Compile, record, and maintain required documents for hazardous-materials and hazardous-waste management activities.	Compile and maintain a h.m. inventory, with knowledge of compliance requirements.	Compile and maintain a h.m. inventory, with knowledge of compliance requirements.	Compile and maintain a h.m. inventory, with knowledge of compliance requirements.	Identify elements in a h.m. inventory and compliance requirements.
Compile and maintain a hazardous-materials inventory	Compile and maintain a h.m. inventory	Compile and maintain a h.m. inventory	Compile and maintain a h.m. inventory	Identify the requirements for maintaining a h.m. inventory
Compile and maintain documentation of hazardous materials, such as: chain of custody, equipment calibration and maintenance, exception reports, field notebooks, incident documentation, laboratory data, manifests, MSDS, purchase orders, shipping documents, and vendor invoices	*Compile and maintain* documentation of hazardous materials, such as: chain of custody, ...	*Maintain* documentation of hazardous materials, such as: chain of custody, ...	*Maintain* documentation of hazardous materials, such as: chain of custody, ...	Identify the requirements for documentation of h.m., such as: chain of custody, ...
Compile and maintain records to prepare compliance reports	*Prepare* compliance reports	*Compile and maintain* records to prepare compliance reports	*Compile and maintain* records to prepare compliance reports	Identify the records needed to prepare compliance reports.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Ensure current MSDS are available in the workplace	*Ensure* current MSDS are available in the workplace	*Follow requirements* for MSDS availability in the workplace.	*Follow requirements* for MSDS availability in the workplace.	Identify the requirements for MSDS in workplace
Operate and maintain auditable record-keeping systems in accordance with regulatory requirements.	*Develop*, operate and maintain auditable record-keeping systems in accordance with regulatory requirements.	*Operate and maintain* auditable record-keeping systems in accordance with regulatory requirements.	*Operate and maintain* auditable record-keeping systems in accordance with regulatory requirements.	Identify the components of a record-keeping systems, according to regulatory requirements.
Conduct and maintain a hazardous waste inventory	Conduct and maintain a h.w. inventory	Conduct and maintain a h.w. inventory	Conduct and maintain a h.w. inventory	Identify elements of a h.w. inventory
Communicate with suppliers to obtain product identification and labeling	Communicate with suppliers to obtain product id and labeling	Communicate with suppliers to obtain product id and labeling	Communicate with suppliers to obtain product id and labeling	Not covered
Identify and maintain an inventory of empty and full containers	Identify and maintain an inventory of empty and full containers	Identify and maintain an inventory of empty and full containers	Identify and maintain an inventory of empty and full containers	Identify requirements of container inventories.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY	Level of Profession			
Skills Standard	Master	Associate		Compliance
Compile and maintain personal health and safety records	*Develop* health/safety record system, with knowledge of regulatory requirements	*Compile and maintain* personal health and safety records, with knowledge of regulatory requirements	*Maintain* personal health and safety records, with knowledge of regulatory requirements	Identify requirements for health/safety records.
Read and interpret blueprints, flow diagrams, and schematics	Read and *interpret* blueprints, flow diagrams, and schematics.	*Read, collect data and assist* in evaluation of blueprints, flow diagrams, and schematics.	*Read and collect* data from blueprints, flow diagrams, and schematics.	Not covered
Implement procedures to comply with appropriate regulations.				
Read and apply regulatory standards to ensure compliance in operations	Read and apply regulatory standards to ensure compliance in operations	Read and apply regulatory standards to ensure compliance in operations	Read and apply regulatory standards to ensure compliance in operations	Identify regulatory requirements for operations.
Obtain hazardous-materials and hazardous-waste permits and/or approvals	*Obtain* h.m. and h.w. permits and/or approvals	*Complete* appropriate forms for h.m. and h.w. permits.	*Complete* appropriate forms for h.m. and h.w. permits.	Identify appropriate forms needed to meet compliance requirements.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Describe the regulatory process, from the introduction of a bill to the promulgation of a regulation	*Understand* the regulatory process.	*Describe* the regulatory process and *understand* when a regulation effects the current method of operation.	*Understand the difference between* introduction of a bill and promulgation of a regulation.	Identify the results of promulgated regulations.
Identify and describe the penalties for noncompliance	Identify and describe penalties for noncompliance and *make recommendations* to meet compliance requirements	*Identify and describe* the penalties for noncompliance	*Identify and describe* the penalties for noncompliance	Identify and describe the penalties for noncompliance
Differentiate between federal, state, and local hazardous-materials and hazardous-waste regulations and identify appropriate regulatory agencies	Differentiate between federal, state, and local h.m. and h.w. regulations...	Differentiate between federal, state, and local h.m. and h.w. regulations...	Differentiate between federal, state, and local h.m. and h.w. regulations...	Differentiate between federal, state, and local h.m. and h.w. regulations...
Identify regulatory changes and the impact they have on an operation	*Understand* regulatory changes and the impact on operation; *make recommendations* for changes to comply.	*Identify* regulatory changes and potential impact on operations.	*Identify* regulatory changes and possible impacts on operations.	Identify reference material containing regulatory change notices.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Comply with federal, state, and local hazardous-materials regulations	Comply with federal, state, and local h.m. regulations	Comply with federal, state, and local h.m. regulations	Comply with federal, state, and local h.m. regulations	Identify federal, state, and local h.m. regulations.
Conduct audits and inspections to ensure hazardous-waste management activities are in compliance with federal, state, and local regulations	Conduct audits and inspections and *take action* to ensure h.w. management activities are in compliance with federal, state, and local regulations	*Conduct audits and inspections* to identify activities in noncompliance with federal, state, and local regulations	*Conduct audits and inspections* to identify activities in noncompliance with federal, state, and local regulations	Identify federal, state, and local regulations for h.w. management activities
Follow written, company-standard operating procedures	*Develop, make recommendations for, and follow* company standard operating procedures.	*Follow written,* company-standard operating procedures	*Follow written,* company-standard operating procedures	Not covered
Comply with federal, state, and local health and safety regulations	Comply with federal, state, and local health/safety regulations and *take appropriate action* for noncompliance.	*Describe and comply* with federal, state, and local health/safety regulations	*Describe* federal, state, and local health/safety regulations.	Identify federal, state, and local health/safety regulations.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Identify sources of current or timely regulatory information	Identify and read sources of current or timely regulatory information	Identify and read sources of current or timely regulatory information	Identify and read sources of current or timely regulatory information	Identify sources of current or timely regulatory information
Implement applicable safety regulations and procedures.				
Demonstrate safe health and work habits	*Demonstrate and direct personnel* in safe health and work habits.	*Demonstrate* safe health and work habits	*Demonstrate* safe health and work habits	Not covered
Read and implement other regulatory standards and guidance relative to worker safety and health such as: blood borne pathogens, confined space, emergency egress, fire safety, hearing conservation, and lockout/tagout	*Read and implement* other regulatory standards and guidance relative to worker safety...	*Read and implement* other regulatory standards and guidance relative to worker safety...	*Describe* other regulatory standards and guidance relative to worker safety...	Identify sources of regulatory standards and guidance relative to worker safety...
Identify and describe unsafe workplace and job conditions and implement corrective actions	*Identify and correct* unsafe workplace and job conditions.	*Identify, describe* unsafe workplace conditions and make recommendations for corrective actions.	*Identify and describe* unsafe workplace and job conditions.	Not covered

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Select and use appropriate personal protective equipment and respiratory protection.				
Use and interpret chemical reference materials in the selection of appropriate personal protective equipment (PPE) and respirators	*Select and use* PPE and respirators according to situation and chemical information	*Use chemical reference materials to select* appropriate PPE and respirators according to situation.	*Use chemical reference materials in selecting* appropriate PPE and respirators.	Identify PPE and respirators and respective situations for appropriate use.
Communicate with suppliers and manufacturers to obtain personal protective and respiratory equipment information	Communicate with suppliers and manufacturers to obtain PPE...	Communicate with suppliers and manufacturers to obtain PPE...	Communicate with suppliers and manufacturers to obtain PPE...	Identify suppliers and manufacturers as resources to PPE information.
Identify, describe, and use PPE appropriate to the work conditions	Identify, describe, and use PPE appropriate to the work conditions	Identify, describe, and use PPE appropriate to the work conditions	Identify, describe, and use PPE appropriate to the work conditions	Identify and describe PPE and appropriate use according to work conditions
Identify and describe the elements of respiratory protection and PPE plans	Identify, describe and *develop* PPE and respiratory plans.	*Identify and describe the elements* of respiratory protection and PPE plans	*Identify and describe the elements* of respiratory protection and PPE plans	Identify and describe the elements of respiratory protection and PPE plans

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Identify, describe, and use respiratory protection appropriate to the work conditions	Identify, describe, and use respiratory protection appropriate to the work conditions	Identify, describe, and use respiratory protection appropriate to the work conditions	Identify, describe, and use respiratory protection appropriate to the work conditions	Identify, describe, and use respiratory protection appropriate to the work conditions
Identify and describe hazards associated with the use and limitations of PPE and respiratory protection	Identify and describe hazards associated with the use and limitations of PPE and respiratory protection; *adjust procedures and direct personnel accordingly.*	*Identify and describe* hazards associated with the use and limitations of PPE and respiratory protection	*Identify and describe* hazards associated with the use and limitations of PPE and respiratory protection	Identify and describe hazards associated with the use and limitations of PPE and respiratory protection
Maintain and inspect PPE and respiratory protection systems according to regulations	*Maintain and inspect* PPE and respiratory protection systems according to regulations	*Maintain and inspect* PPE and respiratory protection systems according to regulations	*Describe the procedures* involved in maintaining and inspecting PPE and respiratory protection systems according to regulations.	Identify the regulatory requirements involving maintaining and inspecting PPE and respiratory protection systems.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Collect, prepare, document, and ship samples for analysis.				
Perform and document sampling for hazardous-waste characterization purposes	Perform and document sampling for hazardous-waste characterization purposes	Perform and document sampling for hazardous-waste characterization purposes	Perform and document sampling for hazardous-waste characterization purposes	Not covered
Perform field tests according to instructions and procedures	Perform field tests according to instructions and procedures	Perform field tests according to instructions and procedures	Perform field tests according to instructions and procedures	Identify regulations regarding procedures and documentation of field tests
Calibrate and operate, as required, field-test equipment such as: air-monitoring equipment, bailers, hand augers, organic-vapor analyzers, pumps, radioactivity measuring equipment, and split spoons	*Calibrate and operate*, as required, field-test equipment such as:...	*Operate and check calibration* of field-test equipment such as:...	*Operate and check calibration* of field-test equipment such as:...	Identify regulations regarding the documentation of calibration of field test equipment...
In accordance with instructions and/or procedure, collect samples such as: air and soil, bulk materials, groundwater, solid wastes, and surface water	In accordance with instructions and/or procedure, collect samples such as: ...	In accordance with instructions and/or procedure, collect samples such as: ...	In accordance with instructions and/or procedure, collect samples such as: ...	Not covered

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Identify and demonstrate an ability to adjust procedures appropriately for potential sample interferences	*Identify and demonstrate* an ability to adjust procedures...	*Identify potential* sample interferences and *assist in making adjusting* procedures	*Identify potential* sample interferences and *assist in making adjusting* procedures	Not covered
Decontaminate equipment in accordance with quality-control/quality assurance procedures	*Decontaminate* equipment in accordance with...	*Identify the need* for equipment decontamination and *follow instructions* according to qc/qa procedures.	*Identify the need* for equipment decontamination.	Identify the requirements for equipment decontamination.
Identify and describe the appropriate use, limitations, and applications of sampling equipment such as: colorimetric indicator, combustible-gas indicator, and organic-vapor analyzer	Based on limitations and applications of equipment, appropriately *use* sampling equipment such as: ...	*Identify and describe* the appropriate use, limitations, and applications of sampling equipment such as: ...	*Identify and describe* the appropriate use, limitations, and applications of sampling equipment such as: ...	Not covered
Perform personnel-exposure monitoring in accordance with appropriate standards such as: noise monitoring, oxygen monitoring, radiation dosimetry, temperature extremes, and Threshold Limit Value-Biological Exposure indices	*Perform personnel-exposure* monitoring in accordance with appropriate standards such as: ...	*Identify* symptoms indicating personnel-exposure according to appropriate standards such as:... *Make recommendations* for appropriate action.	*Identify* symptoms indicating personnel-exposure according to appropriate standards such as:...	Identify regulatory standards involved in personnel exposure monitoring.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Prepare and ship samples to laboratory	Prepare and ship samples to laboratory	Prepare and ship samples to laboratory	Prepare and ship samples to laboratory	Not covered
Transport and store hazardous-materials and hazardous waste in accordance with applicable regulations.				
Monitor documentation related to the shipment of hazardous-materials and hazardous-wastes	Complete documentation related to the shipment of h.m. and h.w.	Complete documentation related to the shipment of h.m. and h.w.	Complete documentation related to the shipment of h.m. and h.w. *according to instructions.*	Identify forms and procedures for documenting shipment of h.m. and h.w., according to regulations.
Identify incompatible combinations of chemicals that could result in dangerous situations	Identify incompatible combinations of chemicals that could result in dangerous situations and *take appropriate actions.*	Identify incompatible combinations of chemicals that could result in dangerous situations and *make action recommendations*	Identify incompatible combinations of chemicals that could result in dangerous situations and *make action recommendations*	Identify regulations concerning handling of incompatible waste.
Label containers with appropriate identification and expiration information	Label containers with appropriate identification and expiration information	Label containers with appropriate identification and expiration information	Label containers with appropriate identification and expiration information	Identify elements of proper labeling of containers.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Safely package, load, document, and ship hazardous-materials and hazardous-wastes in compliance with appropriate regulations	Safely package, load, document, and ship h.m. and h.w. in compliance with appropriate regulations	Safely package, load, document, and ship h.m. and h.w. in compliance with appropriate regulations	Safely package, load, document, and ship h.m. and h.w. in compliance with appropriate regulations	Identify regulations concerning packaging, loading, documentation, and shipping of h.w. and h.m.
Inspect hazardous-waste storage areas for compliance with appropriate rules and regulations	Inspect h.w. storage areas for compliance with appropriate rules and regulations and *take corrective actions*	Inspect hazardous-waste storage areas for compliance with appropriate rules and regulations and *make recommendations* for actions	Inspect hazardous-waste storage areas for compliance with appropriate rules and regulations and *make recommendations* for actions	Identify appropriate rules and regulations for hazardous waste storage areas.
Properly segregate and store incompatible hazardous-materials and hazardous-wastes	Properly segregate and store incompatible h.m. and h.w. *and take action to minimize mixing of wastes*	*Properly segregate and store* incompatible hazardous-materials and hazardous-wastes	*Properly segregate and store* incompatible hazardous-materials and hazardous-wastes	Identify regulations concerning mixed wastes.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Operate hazardous-materials and hazardous-waste treatment and disposal systems.				
Record and maintain documentation of operations activities	Record and maintain documentation of operations activities	Record and maintain documentation of operations activities	Record and maintain documentation of operations activities	Identify requirements for records and documentation of operation activities.
Follow appropriate plans such as: assessment plan, health and safety plan, initial sampling plan, remediation plan, risk-assessment plan, site-closure plan, standard operating procedures, waste-minimization plan	Follow appropriate plans such as: assessment plan, health and safety plan, etc.	Follow appropriate plans such as: assessment plan, health and safety plan, etc.	Follow appropriate plans such as: assessment plan, health and safety plan, initial sampling plan, etc.	Identify elements of appropriate plans such as: assessment plan, health/safety plan, initial sampling plan, etc.
Assist and contribute to the development and revision of plans and reports such as: assessment plan, health and safety plan, initial sampling plan, remediation plan, risk-assessment plan, site-closure plan, standard operating procedures, waste-minimization plan	*Development and revise plans* and reports such as: assessment plan, health/safety plan, initial sampling plan, etc.	*Assist and contribute to the development and revision of plans* and reports such as: assessment plan, health and safety plan, etc.	*Assist and contribute to the development* and revision of plans and reports such as: assessment plan, health and safety plan, etc.	Identify requirements for revisions and updates of appropriate plans such as: assessment plan, etc.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Prepare and maintain hazardous-waste manifests and associated documents for inspection	Prepare and maintain hazardous-waste manifests and associated documents for inspection	Prepare and maintain hazardous-waste manifests and associated documents for inspection	Prepare and maintain hazardous-waste manifests and associated documents for inspection	Prepare and maintain hazardous-waste manifests and associated documents for inspection
Select appropriate drums and containers	Select appropriate drums and containers for storage and disposal of h.w. and h.m.	Select appropriate drums and containers for storage and disposal of h.w. and h.m.	Select appropriate drums and containers for storage and disposal of h.w. and h.m.	Identify regulations for drums and containers and the storage of h.w. and h.m.
Implement good housekeeping practices in the workplace	Implement good housekeeping practices in the workplace	Implement good housekeeping practices in the workplace	Implement good housekeeping practices in the workplace	Not covered
Check and document activities of hazardous-waste treatment and disposal contractors	*Check and document* activities of h.w. treatment and disposal contractors	*Check and document* activities f h.w. treatment and disposal contractors	*Document* activities of h.w. treatment and disposal contractors	Identify requirements for documentation concerning h.w. treatment and disposal contractors.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Working individually or with others, develop improvements in the reduction, reuse, recycling, or disposal of waste streams	Working individually or with others, develop improvements in the reduction, reuse, recycling, or disposal of waste streams	Working individually or with others, develop improvements in the reduction, reuse, recycling, or disposal of waste streams	Working individually or with others, develop improvements in the reduction, reuse, recycling, or disposal of waste streams	Not covered
Coordinate collection and disposal of empty containers	Coordinate collection and disposal of empty containers	Coordinate collection and disposal of empty containers	Coordinate collection and disposal of empty containers	Identify regulations concerning disposal of empty containers
Prepare accumulated hazardous waste for proper disposal	Prepare accumulated hazardous waste for proper disposal	Prepare accumulated hazardous waste for proper disposal	Prepare accumulated hazardous waste for proper disposal	Identify regulations for accumulated hazardous waste disposal
Identify and describe treatment, removal, and disposal systems such as:bio-remediation, chemical and physical, deep-well injection, incineration, vitrification, volatile organic compounds	Identify and describe treatment, removal, and disposal systems such as:bio-remediation, etc.	Identify and describe treatment, removal, and disposal systems such as:bio-remediation, etc.	Identify and describe treatment, removal, and disposal systems such as:bio-remediation, etc.	Identify treatment, removal, and disposal systems such as: bioremediation, etc.

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY Skills Standard	Level of Profession			
	Master	Associate		Compliance
Identify and describe hazards associated with abatement of materials such as: asbestos, fiberglass, lead, and others	Identify and describe hazards associated with abatement of materials such as: asbestos, fiberglass, lead, and others	Identify and describe hazards associated with abatement of materials such as: asbestos, fiberglass, lead, and others	Identify and describe hazards associated with abatement of materials such as: asbestos, fiberglass, lead, and others	Identify regulations concerning abatement of materials such as: asbestos, etc.
Identify and describe hazards associated with treatment, removal, and disposal systems and operations	Identify and describe hazards associated with treatment, removal, and disposal systems and operations	Identify and describe hazards associated with treatment, removal, and disposal systems and operations	Identify and describe hazards associated with treatment, removal, and disposal systems and operations	Identify regulations associated with treatment, removal, and disposal systems and operations
Provide on-the-job training as required	*Provide on-the-job training* as required	*Serve as contact person* for information concerning h.m. and h.w. operations	*Serve as contact person* for information concerning h.m. and h.w. operations	Identify job training requirements for different employees as designated by RCRA and OSHA

Meeting Notebook (1 example)

Contents were used at a dissemination workshop.

Overview of the Skills Standard Project

The Industrial Vision

3 Hazardous Materials Management Technician Skills Standard

4 Industrial Site Visits

5 Skills Standard—The School-to Work Connection

6 Developing Educational Goals from Standards

7 Postsecondary Resources

8 Certification

9 Miscellaneous

10

11

12

Hazardous Materials Management Technicians Skills Standard Dissemination Workshop for Educators

Maurice W. Roney Teaching Center, Waco, Texas

October 3-4, 1994
Workshop Agenda

Monday, October 3

7:30 a.m.	**CORD shuttle van from Hilton to Roney Teaching Center**
8:00 a.m.	**Registration and continental breakfast**
8:15 a.m.	**Introduction** Welcome Overview of the Skills Standard Project Introduction of Participants *Mr. Jim Johnson, Skills Standard Project Director, CORD* Introduction to CORD *Dr. Walt Edling, Vice President for Service Programs, CORD*
9:30 a.m.	**Break**
10:00 a.m.	**The industrial vision** *Moderator: Mr. Robert Bear, P.E., Facilities and Environmental Consultants, Inc.* Remediation *Ms. Lois George, LaMoreaux Associates* Laboratory *Mr. Roger Wise, City of Tampa* Compliance *Mr. Steve Wiederwax, American Marazzi Tile, Inc.* *Ms. Kristi LaRue, Texas National Resource Conservation Commission* Transportation *Mr. Bruce Rodgers, Electric Fuels Corporation*
Noon	**Lunch**
1:00 p.m.	**Panel discussion** *Industrial representatives, Moderator: Mr. Robert Bear*
2:30 p.m.	**Hazardous Materials Management Technicians Skills Standard** *Mr. Jim Johnson and Mr. Robert Bear*
3:00 p.m.	**Break**
3:30 p.m.	**Industrial site visits (small groups)** Allergan, Marathon Power Technologies, Plantation Foods
5:00 p.m.	**Return to Hilton**
6:30 p.m.	**Banquet** *Guest Speaker: Tom Smith, Union Pacific Railroad*

Hazardous Materials Management Technicians
Skills Standard Dissemination Workshop for Educators

Maurice W. Roney Teaching Center, Waco, Texas

October 3-4, 1994
Workshop Agenda

Tuesday, October 4

7:30 a.m.	**CORD shuttle van from Hilton to Roney Teaching Center**
8:00 a.m.	**Continental breakfast, Roney Teaching Center**
8:15 a.m.	**Report on site visits** *Participants*
8:45 a.m.	**Skills Standard—the school-to-work connection** *Dr. Walt Edling*
9:45 a.m.	**Break**
10:00 a.m.	**Developing educational goals from standards** • Occupational Skills • General/Academic Skills • Assessment of Skills
Noon	**Lunch**
1:00 p.m.	**Postsecondary resources** *Mr. Doug Feil, Hazardous Materials Training and Research Institute* *Mr. Chuck Ernst, NCATC/NIST Liaison*
2:00 p.m.	**Certification** *Mr. Bob Quier, National Environmental Training Association*
3:00 p.m.	**Closing** *Mr. Jim Johnson*

Hazardous Materials Management Technicians
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Maurice W. Roney Teaching Center, Waco, Texas

October 3-4, 1994

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Hazardous Materials Management Technicians Skills Standard Project

Fact Sheet

September 2[illegible], 1994

HAZARDOUS MATERIALS MANAGEMENT TECHNICIAN
SKILL STANDARDS PROJECT

FACTS ABOUT SKILL STANDARDS PROJECTS:

- Skill standards identify the skills, attitudes, knowledge and level of ability an individual needs to perform successfully in the workplace.
- They will be a common, standardized system for classifying and describing the skills needed for a particular occupation.
- They form a cornerstone of the Clinton Administration's workforce development system.
- There are twenty-two (22) projects currently in process.
- Projects are a joint effort of the Department of Labor and the Department of Education.
- CORD is assigned two Skill Standards Development Projects (the other being Photonics).
- *ALL SKILL STANDARDS ARE TO BE VOLUNTARY AND INDUSTRY BASED.*

ADVANTAGES OF SKILL STANDARDS

- Make the US more competitive in a global market. We are the only industrialized nation without skill standards.
- Businesses will have better information to hire highly skilled workers.
- Students entering the labor force will have more complete information about job skills.
- Training providers will become more accountable since training will have a measurable standard for evaluation.
- Assist educators develop effective and efficient training programs and curriculum materials.
- Will have impact on the Dictionary of Occupational Titles.

THE CENTER FOR OCCUPATIONAL RESEARCH AND DEVELOPMENT (CORD)

- Non-profit, public service organization
- Approximately 100 employees
- Nearly two decades of service to education
- International in scope
- Dedicated to emerging technologies
- Prime-mover in the national TECH PREP initiatives
- Develops curriculum materials based on CONTEXTUAL LEARNING concepts

HAZMAT ADVISORY COMMITTEE MEMBERS ARE EXPECTED TO

- Provide guidance to the project.
- Provide technical expertise relative to skills needed for successful employment.
- Identify specialities within Hazardous Materials Management Technology based on occupational needs.
- Promote the skill standards development work within their organization and profession.
- Read and give feed-back on correspondence.
- Attend Advisory Committee meetings.
- Attend regional focus group meetings when held in the area.

PROJECT PLANS AND ACTIVITIES

- Develop a questionnaire to gather data from potential employers of Hazardous Materials Management Technicians regarding job functions
- Use the comments on the questionnaire to generate a tentative list of skills.
- Disseminate the tentative skill list to obtain information about the priority of each skill.
- Determine if regional variations to the skill list change the priority in different geographical areas.
- Assemble data and produce a skill list to be validated by the advisory committee and others.
- Disseminate the final skill list to schools and interested employers.
- Assemble a committee to evaluate the certification of HAZMAT technicians
- Prepare a final report on the project and deliver the validated skill list to the Department of Education prior to November 1, 1994

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Hazardous Materials Management Technicians Skills Standard Project

General Information

GENERAL INFORMATION ABOUT DEVELOPMENT OF SKILL STANDARDS FOR HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY

OVERALL PROJECT GOAL

To develop business and education skill standards for Hazardous Materials Management Technologies.

DEFINITION

.Skill Standards identify the knowledge, skill, level of ability and attitudes needed to satisfactory perform a given job. Standards may be specific to a given occupation, may cross occupational lines, or may apply to groups of occupations."

BACKGROUND

A national system of voluntary skill standards is being developed through partnerships and balanced participation of business, industry, labor, educators and other key groups. This project is one of a series of skill standards development projects that has been funded by the US Department of Education. Similar skill standards for other technologies are being developed under grants from the Department of Labor.

The skills, adaptability, creativity and knowledge of American workers must be the foundation for our continued competitiveness in a global economy. However, problems exist in the lack of connection between the skills needed in the workplace and the skills imparted through education and training. Limitations also exist today due to the lack of nationally recognized credentials for specific occupations.

Skill standards projects, such as this, are intended to fill this void and make a strong connection between employment needs of business and industry and the educational institutions that prepare people for employment.

HOW WILL THESE SKILL STANDARDS BE USED?

The results of this project will give guidance from a national perspective, to schools that offer or intend to offer training for entry level employment of Hazardous Materials Management Technicians. These skill standards will also help guide curriculum development projects in the future.

Hazardous Materials Management Technicians Skills Standard Project

What Are Skill Standards?

Center for Occupational
Research & Development

What are Skill Standards?

SKILL STANDARDS

- Key component of Goals 2000: Educate America
- Funding authorized by the Carl Perkins Vocational and Applied Technology Act
- Joint effort of the Departments of Education and Labor
- Voluntary and Industrial Based

DEFINITION

- Skill Standards identify the knowledge, skills, attitudes and level of ability an individual needs to perform successfully in the workplace.

- They have no uniform nor required format

- They form the cornerstone of this Administration's workforce development system.

ADVANTAGES

- Students entering the labor force will have better information
- Businesses will have better information to hire highly skilled workers
- Accountability among training providers because of a measurable standard for evaluation
- Assist educators develop effective and efficient training programs
- Impact on the Dictionary of Occupational Titles

Center for Occupational
Research & Development

NATIONAL SKILL STANDARDS PROJECTS

DEPARTMENT OF EDUCATION

Health Science and Technology

Electronics

Computer-aided Drafting

Air conditioning, Refrigeration and Power

Biotechnical Sciences

Printing

Automotive, Auto Body and Truck Technicians

Human Service Occupations

Heavy Highway/Utility Construction and Environmental Remediation and Demolition

Chemical Process Industries

Hazardous Materials Management Technician

Photonics Technician

Argiscience/Biotechnology

Welding Occupations

Food Marketing Industry

Forest/Wood Product Production and Manufacturing

DEPARTMENT OF LABOR

Industrial Launderers

Tourism, Travel, & Hospitality

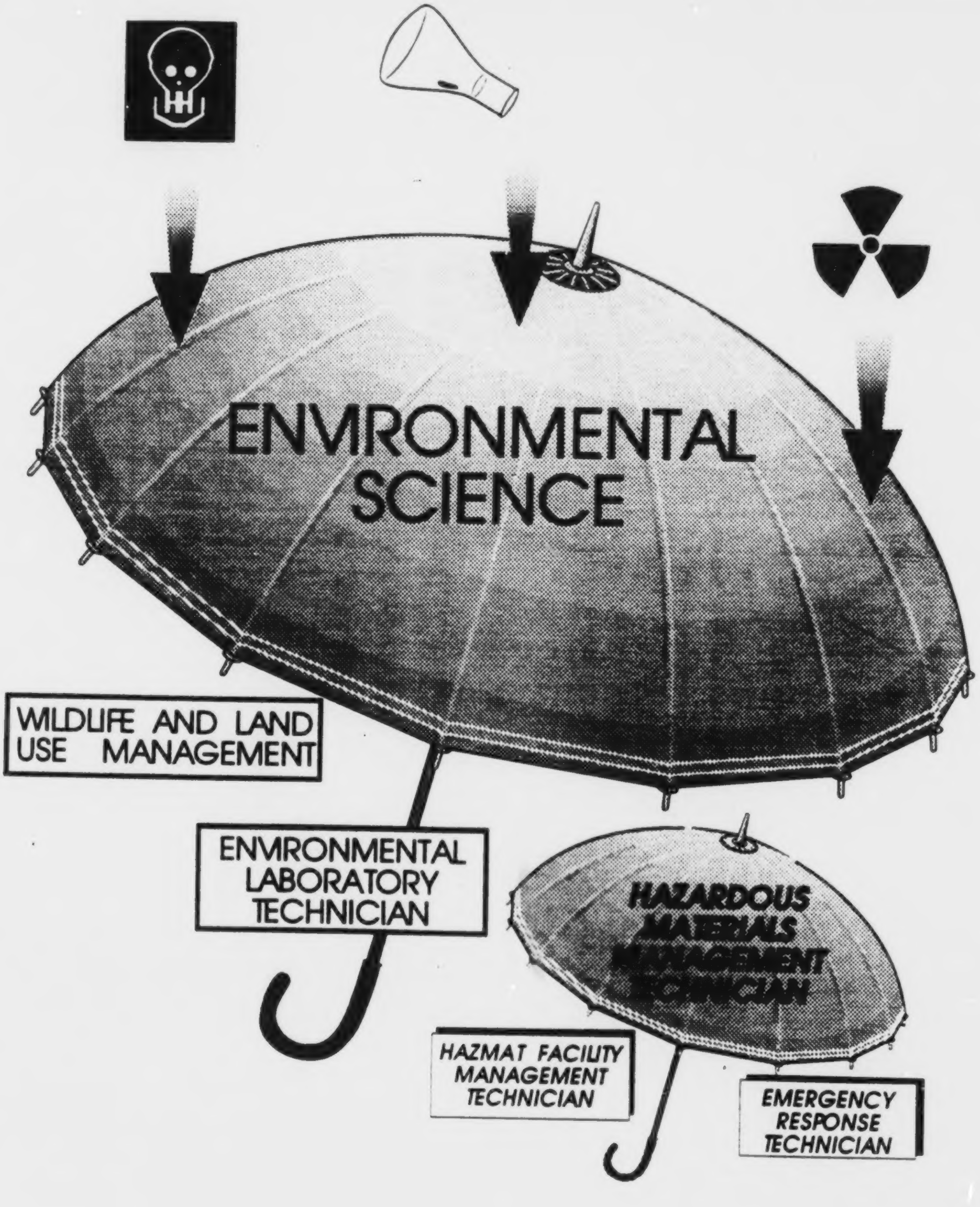
Metal Working

Electronics

Electronics Construction

Retail Trade

Center for Occupational Research & Development


ENVIRONMENTAL SCIENCE
WILDLIFE AND LAND USE MANAGEMENT
ENVIRONMENTAL LABORATORY TECHNICIAN
HAZARDOUS MATERIALS MANAGEMENT TECHNICIAN
HAZMAT FACILITY MANAGEMENT TECHNICIAN
EMERGENCY RESPONSE TECHNICIAN

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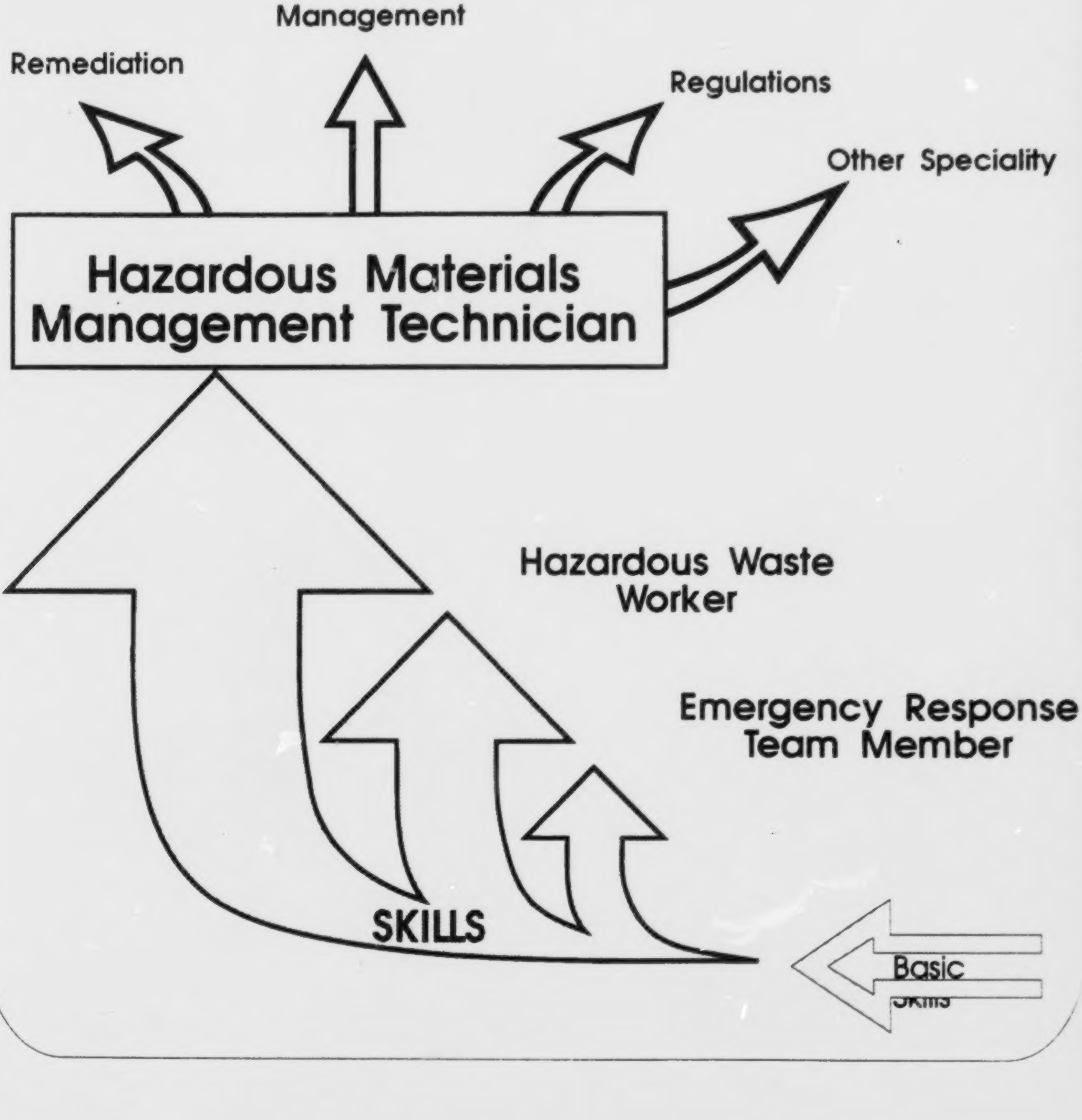


Management

Remediation

Regulations

Other Speciality

Hazardous Materials Management Technician

Hazardous Waste Worker

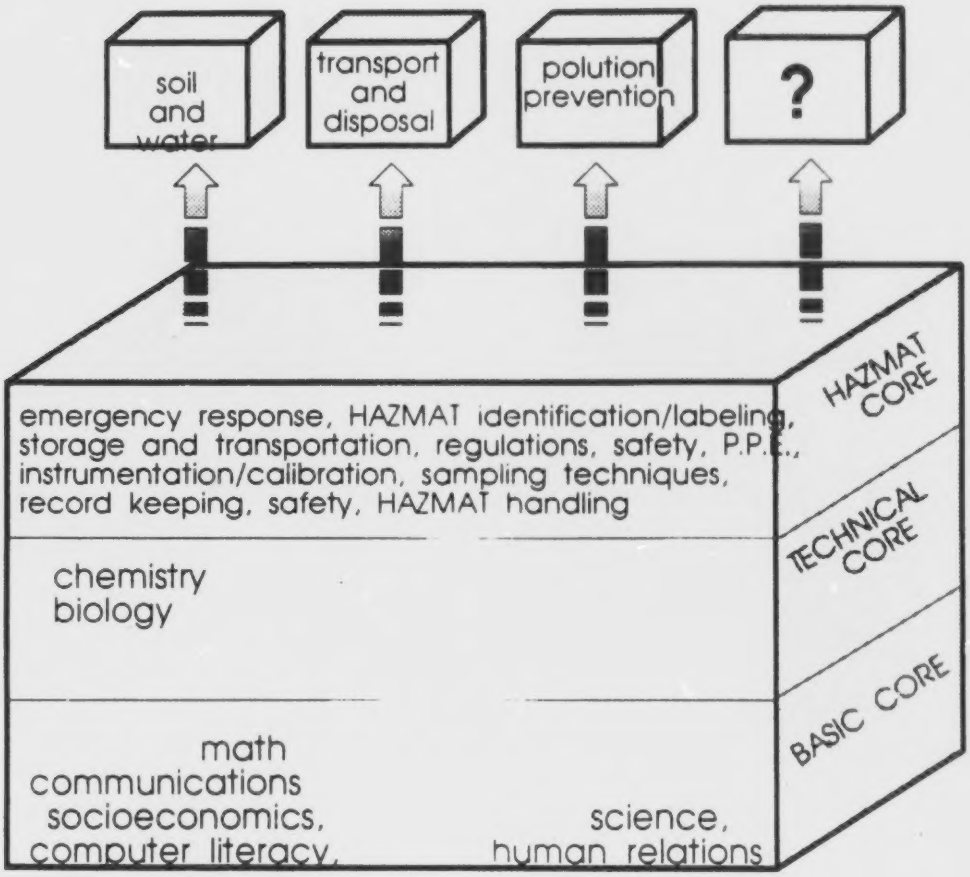
Emergency Response Team Member

SKILLS

Basic Skills

CORD Center for Occupational Research & Development

CURRICULUM CONCEPT



soil and water

transport and disposal

polution prevention

?

HAZMAT CORE

emergency response, HAZMAT identification/labeling, storage and transportation, regulations, safety, P.P.E., instrumentation/calibration, sampling techniques, record keeping, safety, HAZMAT handling

TECHNICAL CORE

chemistry
biology

BASIC CORE

math
communications
socioeconomics,
computer literacy,
science,
human relations

TASK / SKILL LIST

(CATAGORY)
A. Safety

(TASK)
1. Use a fire extinguisher properly

(SKILLS)
a. identify the type of fire
b. select the proper fire extinguisher
c. hold and direct the fire extinguisher
d. verify that the fire has been extinguished

Hazardous Materials Management Technicians Skills Standard Project

Project Report by Jim Johnson

Hazardous Materials Management Technology

Skills Standard Project Report

August 18, 1994

Project Status

The stated goal of the project, as given in the original proposal document, is to "organize and manage a coalition of organizations related to the hazardous materials industry which will identify the skills necessary and the training required for hazardous materials management technicians (HMMT)."

According to the proposal, the goal would be accomplished through the following activities:

1. research businesses and industries involved in hazardous materials management
2. form a coalition of participants in the project
3. select and empower a technical committee including business, education, and labor leaders
4. design, through a participative, iterative process, a model for skill standards in the industry
5. devise a method for assessing and evaluating the model
6. promote a process for maintaining and updating skill standards
7. secure an independent evaluator to conduct a summative evaluation of the project

To accomplish item #1 (above), CORD staff did the following:

- interviewed over 150 technicians, employers, consultants or educators who are actively involved with Hazardous Materials Management Technology. Approximately 3/4 of these interviews were made by phone. The remainder were conducted in face-to-face meetings.
- conducted site visits at the locations listed in the table below. The one on October 25, 1993 at Sherwin-Williams Co. was during and immediately following a fire at a paint store while HMMT personnel were directing fire fighting activities. A different team of HMMT technicians were on site after the fire to direct clean-up activities.

Dates	Organization	Location	Team Member
October 25, 1993	Sherwin-Williams Co.	Waco, TX	Jim Wright
September 29, 1993	Glace & Radcliffe and Associates	Maitland, FL	Robert Bear
November 8, 1993	PDG, Environmental, Inc	Titusville, FL	Robert Bear
November 12, 1993	Radian Corp	Austin, TX	Jim Wright

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November 12, 1993	3M Center	Austin, TX	Jim Wright
August 19, 1994	EG&G/Kennedy Space Center	Cape Canaveral, FL	Robert Bear
September 9, 1994	Kelly Air Force Base	San Antonio, TX	Jim Johnson
September 9, 1994	Wright-Patterson Air Force Base	Dayton, OH	Jim Wright
September 14, 1994	Tupperware Home Parties, Inc	Orlando, FL	Robert Bear
September 21, 1994	Marathon Power Systems	Waco, TX	Jim Wright

To accomplish item #2 (above), the following activities were conducted

- A team was assembled that consisted to two consultants and selected CORD staff. The third-party evaluator, Dr. Jerry Riehl, was part of that team. Dr. Riehl has spent his career as a technical expert in subjects related to chemical and nuclear hazards. Prior to retirement he was the Dean of Technology at South Seattle Community College. His experience, knowledge and personal contacts helped establish the projects direction. Bob Bear, a Professional Engineer and environmental consultant, was retained as part of the project's team. He has served as the chairman of the industrial advisory committee and given the team guidance from the perspective of the employer of HMMT technicians. This team defined the categories of business and industries that should be solicited as members of our advisory committee.

- Telephone and personal interviews discovered a group of interested and knowledgeable individuals who were willing to dedicate time and expenses to the project. This included a commitment to attend two advisory committee meetings and to respond to requests for information throughout the course of the project Attempts were made to keep the committee membership balanced. Approximately 40 individuals originally agreed to serve on the committee. This number has increased to approximately 50 during the project.

- The involvement of professional societies was solicited. Approximately 90 societies were identified whose primary purpose relates to the control of hazardous materials or environmental issues. During the course of the project, six professional societies have responded with active participation. These include the following:

    - National Environmental Health Association (NEHA) consists of a national membership. Public health officials, educators, corporate health and safety personnel and independent consultants constitute the bulk of their membership. They are subcontracted on the project to coordinate other societies and conduct a survey to validate occupational task and skills required for HMMT technicians. NEHA offers certification programs for professionals and technicians working the environmental occupations.

    - National Environmental Training Association (NETA) provides a certification program for individuals who conduct training programs in environmentally related disciplines. To become a Certified Environmental Trainer (CET) an individual must be certified in a technical area related to environmental science prior to attempting certification as a trainer. This organization is closely aligned to community colleges offering training programs.

    - The National Association of Environmental Professionals (NAEP) is a membership organization that serves a wide variety of professionals in environmental fields. A large number of these members are employers of HMMT. The organization offers a certification program for professionals titled Certified Environmental Professional (CEP). They are also actively pursuing a technician certification program.

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- The Hazardous Materials Control Resources Institute (HMCRI) is a membership organization that conducts two major conferences each year and several other training programs. The principle conference, called Superfund, attracts contractors and government agencies that are involved with the clean-up of some of this country's most contaminated sites.
- The Partnership for Environmental Technology Education (PETE) is a coalition of community colleges with programs related to environmental science. Many of them have HMMT programs. This is a national organization which is divided into six geographical regions. Three of the regional organizations have agreed to have students collect survey data from employers in their region. Several of the members of PETE's Board of Directors are members of our advisory committee.
- The Institute for Hazardous Materials Managers (IHMM) and the Academy of Hazardous Materials Managers (AHMM) provide one of the best known certification programs in this technology. It is the Certified Hazardous Materials Manager (CHHM). This group of agencies has provided information and access to the mailing list of certified individuals.

To accomplish Items #3 and #4 (above) the technical advisory committee met in Washington, D.C. on December 3, 1993. A list of possible job titles was presented along with a "straw man" list of tasks for the committee's consideration. A summary of the committees discussion and recommendations was as follows:

- The committee expressed a concern that job titles alone would not be useful at this time. Instead, they categorized HMMT into four occupational groups according to the environment in which the worker is employed. This four categories are as follows:
  - Remediation--this group relates to individuals who are assigned to clean-up contaminated outdoor sites. Superfund sites is a typical example. Other examples include the clean-up of leaky, underground petroleum tanks at gas stations and our nations nuclear facilities.
  - Transportation, treatment, storage and disposal (TTSD)--This category includes the work done within most major companies, oil refineries, chemical process industries, municipal waste treatment facilities and disposal locations such as incinerators.
  - Regulations--since this technology is heavily regulated by government agencies such as EPA, OSHA, and state regulatory groups, technicians who specialize in applying these regulations to the companies application are needed.
  - Laboratory/Analytical--this group includes individuals who work in laboratory facilities. Their principle job tasks relate to collecting, testing and analyzing contaminated soil, air, and liquid samples. This may include workers at municipal waste treatment plants that have to collect and analyze samples on a continual basis. This category may overlap with chemical laboratory technicians.
- Even though the committee identified the four different work groups defined above, they estimated that 80% - 90% of the tasks, skills and knowledge would be identical in all four groups.
- Additionally, the committees directions included the following:
  - the skill standards for HMMT must include all the topics identified by OSHA training requirements. (i.e., a person employed as a HMMT technician must be certifiable according to the OSHA requirements)
  - the project must investigate how regional variations effect the skills expected of a HMMT technician. (i.e., a HMMT technician employed at Hanford, Washington, near the nuclear clean-up site will need skills related to nuclear materials while a HMMT technician employed by

a petroleum company near Houston, Texas or New Orleans, Louisiana, may need other skills--perhaps related to shipping hazardous materials on ocean going vessels.)

- Regional focus group meetings were suggested as a means to investigate this variation. These meetings were held according to the following schedule:

Location	Date	Attendance	Assisting Organization
Seattle, WA	February 23, 1994	33	South Seattle Community College
Miami, FL	March 8, 1994	12	Local Chapter of NAEP
Albuquerque, NM	March 11, 1994	14	American Society of Safety Engineers
New Orleans, LA	April 30, 1994	6	HMCRI
Hagerstown, MD	June, 6, 1994	12	Hagerstown Junior College
New Orleans, LA	June 12, 1994	8	NAEP
Nashua, NH (near Boston, MA)	August 25, 1994	~30	New Hampshire Community College

- To expand the "straw-man" task list, the committee suggested a survey of practitioners. In response, several advisory committee members (and other interested individuals) provided job descriptions for employment categories grouped under the broad title, HMMT. An Activity Journal (Appendix D) was distributed to over 100 employed technicians. The Journal asked them to record the job functions they are responsible for during a typical day. It also asked them to identify tasks they perform weekly, monthly and annually. Approximately 50 responses were returned. The activities listed on the Journals along with task statements from job descriptions were used to convert the "straw-man" task list into a lengthy outline. The task statements in the outline were grouped and a critical verb was associated with each statement. A copy of this outline is included as Appendix E. This outline became the main discussion topic at three of the regional focus group meetings where participants were asked to verify or change the verb given in each statement and to rate each statement according to three levels of priority (1 = high, 2 = medium, and 3 = low).

- In addition to the Advisory Committee meeting held in Washington, DC on December 3, 1994, a second committee meeting was held in Fort Worth, Texas on June 17, 1994. This meeting was arranged by the National Environmental Health Association (NEHA) and coordinated with their annual convention. The advisory committee studied modified versions of the Task/Activity Outline. Committee members were grouped for discussion according to the four work groups identified above (remediation, TTSD, Regulations, laboratory) Modifications were made to the outline statements. The recommendations resulting from the Fort Worth Advisory Committee meeting included the following:
    - Convert the Task/Activity Outline into a survey to be distributed to large numbers of employers for validation. NEHA subcontracted to design, distribute, collect and accumulate date from this survey. (expected to be complete by September 15, 1994)
    - A subcommittee of the HMMT advisory committee should be established to work directly on issues related to job titles. Rick Collins accepted the chairmanship of this committee.

  - Another subcommittee should be formed to consider the issue of certification and assessment of individuals against the standard.

- Due to health related problems, Dr. Jerry Riehl has been unable to continue as an active member of the Project Team. He is, however, available for consultation and will assist with evaluation of the project. Jean Drevdahl was appointed to assume the principle duties of the third-party evaluator and project team member. She began her work by attending the June 17, 1994 advisory committee meeting.

- The Certification and Assessment committee was formed and held the first meeting on July 14 - 15, 1994 in Waco, Texas. Members of the subcommittee and their affiliation are as follows:

Name	Affiliation
Jerry Atlas	Texas State Technical College
Bob Bear	Facilities and Environmental Consultants
Jean Drevdahl	Third-party Evaluator
Llewellyn Fambles	Occupational Safety Training Institute
Dr. Dan McGrew	HMCRI
Reggie Moore	NEHA
Ed Price	Texas State Technical College
Rick Richardson	NETA
Valerie Sherwood	Assessment Specialist
Sharon Speer	Occupational Safety Training Institute
Jim Talley	NAEP

- A Project Team meeting is planned for September 23 - 24, 1994 at the offices of NEHA in Denver, Colorado. The purpose of this meeting is to evaluate the data returned from the survey and to condense the information into one of the suggested formates provided by the Department of Education.

To accomplish Item #5 (above) the following actions have been implemented:

- Third-party evaluators have been part of the planning process from the initiation of the project. The project director is in continual communication with both evaluators.

- Three evaluation reports will be produced by the evaluators. Two formative reports have been generated. A summative report will be produced to evaluate the completed project after October 31, 1994. The two formative reports have been used as mid-course adjustments to assure that the project remains on target.

- Two issues of a newsletter called SKILL STANDARD REPORT has been produced and mailed to nearly 1000 interested individuals from industry and education. This newsletter not only gives information about the skill standards by seeks feedback from readers.

- A Skill Standard Workshop is planned to be held in Waco on October 3 - 4, 1994. The purpose of the workshop will be to help educators design strategies to implement the Standard in their education process. Industrial experts, who have been involved with the design of the Standard, will make presentations at the workshop and work with the educators in small groups to formulate methods of implementing the Standard in existing HMMT programs or evaluate the need and structure of new HMMT programs.

To accomplish item #6 (above) the following actions have been taken:

- The certification subcommittee, at its meeting in Waco on July 14 -15, gave several recommendations that will help to maintain and update the standards over time. Their recommendations included the following:
    - Training programs should be accredited by an organization consisting of educational providers. These may include public schools, private schools and consulting agencies. PETE was mentioned several times as such an organization. The intention would be to develop accrediting requirements for Hazardous Materials Management Technology Programs that would be consistent with the National Skill Standard. The requirements would include items like teacher qualifications, facilities, lab-to-lecture ratio, hours of instruction, etc.
    - A certification program for individuals graduating from accredited programs should also be implemented. Certification programs may be operated by different agencies but professional societies would be a typical choice. A comprehensive certification for a "general" HMMT should be maintained by a technician orientated organization. (Since that meeting, the Federation of Environmental Technicians (FET) has been identified as an organization that may fulfill this activity).
    - Specialty certifications should also be made available for sub-sets of the Hazardous Materials Management industry. For instance, a specialization certification could be available in Nuclear Technology after an individual has completed the comprehensive certification.
    - The Skill Standard must be the basis for any certification program. Assessment of individual's skills can be accomplished by a comprehensive test but must also contain some performance based items. The assessment of performance-based skills can be accomplished while a student is enrolled in an accredited program.
    - Certification should be directed toward "job entry" skills. A degree should not be a requirement for certification.
    - Periodic re-certification and assessment should be built into the program.
    - A continuing education requirement should be incorporated in the re-certification process.
- A database has been constructed in which data from schools with Hazardous Materials Management Programs can be entered. Four general topics are included in the database which are as follows:
    - School information including contact name, address, phone, etc.
    - Program information including type, length, degree or certificate
    - Course information including course title, length, etc.
    - Textbook information for each course in the program.
- The data from approximately 20 schools have been entered into the database at this time. These schools have volunteered the information or provided only a school catalog. A great deal of addition effort is needed to get a reasonably complete set of data.
- Presentations about the Skill Standard Project been make at various community college meetings. These include two PETE meetings, two semi-annual meetings of the National Coalition of Advanced

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Technology Centers (NCATC) and at the National Tech Prep Network (NTPN) meeting. A total of approximately 200 individuals have attended these presentations.

- An article on the project has been submitted to a publisher. It is expected to be published in the *Journal of Occupational Safety and Health* in the near future.

To accomplish item #7 above CORD has assembled a team of evaluators. Dr. Jerry Riehl has been involved with the project since its beginning. Jean Drevdahl was added to the evaluation team when Dr. Riehl's health prevented him from traveling. Dr. Riehl constructed the first formative report and Ms. Drevdahl gave the second formative evaluation. Ms. Drevdahl will prepare the summative report with consultation from Dr. Riehl.

Hazardous Materials Management Technicians Skills Standard Project

Advisory Committee Members

NAME	Identifier or SIC Code	12/3/93 Washington D.C. **Advisory**	2/3/94 Seattle, WA **Regional**	3/8/94 Miami, FL **Regional**	3/11/94 Albuquerque, NM **Regional**	4/30/94 New Orleans, LA **Regional**	6/6/94 Hagerstown, MD **Regional**	6/12/94 New Orleans, LA **Regional**	6/17/94 Fort Worth, TX **Advisory**	7/14-15/94 Waco, TX **Subcommittee**
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Thomas J. Bartel* Product Environmental Affairs Manager Unisys Corporation 2525 East Camelback Road, Suite 1000 Phoenix, AZ 85016 602/224-4221 FAX 602/224-4285									Yes	
Bob Bear* Facilities & Environmental Consultants, Inc. 205 Cambridge Drive Longwood, FL 32779-5709 407/682-6238 FAX 407/682-7256	8711	Yes		Yes		Yes			Yes	Yes
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*** Indicates current committee members**

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Eva Bonilla* CEO, Occupational Safety McBon Environmental and Construction, Inc. 9000 West Bellfort, Suite 570 Houston, TX 77031 713/270-6882 FAX 713/270-8735		No							Yes	
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Charley Cook* Training Manager Em Tech 303 Arthur Street Ft. Worth, TX 76107		Yes								

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Garland Gobble* NEHA Region 8 2520 South 5th Street Arlington, VA 22204 703/358-4985 FAX 703/358-5233		Yes							Yes	

HAZARDOUS MATERIALS MANAGEMENT TECHNICIANS SKILLS STANDARD ADVISORY COMMITTEE **9/30/94** *** Indicates current committee members**

NAME	Identifier or SIC Code	12/3/93 Washington D.C. Advisory	2/3/94 Seattle, WA Regional	3/8/94 Miami, FL Regional	3/11/94 Albuquerque, NM Regional	4/30/94 New Orleans, LA Regional	6/6/94 Hagerstown, MD Regional	6/12/94 New Orleans, LA Regional	6/17/94 Fort Worth, TX Advisory	7/14-15/94 Waco, TX Subcommittee
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Bill Lindburg* Lakeshore Technical College HAZMAT Department 1290 North Avenue Cleveland, WI 53015 414/458-4183 x 652										
Jon Lovegreen, CEO* Applied Geosciences, Inc. 29B Technology Drive, Suite 100 Irvine, CA 92718 714/453-8545 x 212	8711	No								
Edward Martin* Executive Director Hazardous Materials Control Research Institute One Church Street, Suite 200 Rockville, MD 20850-4129 301/251-1900 FAX 301/738-2330		No					Yes			
Ian Moar, Executive Director Coalition for Responsible Hazardous Waste Incineration 1133 Connecticut Avenue NW Washington, D.C. 20036 202/775-9839 FAX 202/833-8491		Yes ✓								

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Daniel McGrew* HMCRI One Church Street #200 Rockville, MD 20850 301/251-1900 FAX 301/738-2330							Yes			Yes
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Joe Nichols* Principal Engineer Regulatory Analysis Westinghouse Hanford Company P.O. Box 1970 MISN H6-22 Richland, WA 99352			Yes							
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Carl V. Wyatt* Futures Education and Training Analyst Office of Deputy Chief of Staff for Training U.S. Army HQ TRADOC ATTN: ATTG-CF Ft. Monroe, VA 23651-5000 804/728-5528 FAX 804/728-5544	Army					Yes				
Michael E. Zientek* Coe-Truman Technologies, Inc. 669 Woodland Sq. Loop SE, Suite C Lacey, WA 98503 206/438-0115			Yes							

Hazardous Materials Management Technicians Skills Standard Project

Formative Summary Report 2 to The U.S. Department of Education

by Jean Drevdahl

Business and Education Standards for Hazardous Materials Management Technicians

Funded by the U.S. Department of Education
Grant No. V244B30010

Formative Summary Report 2

by

Jean Drevdahl,
Third-Party Evaluator

September 14, 1994

Hazardous Materials Management Technology
Formative Summary #2

Overview

The development of Occupational Skill Standards for Hazardous Materials Management Technology (HMMT) is a process that is being funded by a grant from the Department of Education in conjunction with the Center for Occupational Research and Development, CORD, located in Waco, Texas. The process is well underway and will soon produce a survey that will be sent to a representative sample of individuals in the Hazardous Materials field. The results will then be analyzed and the information distributed to those who would like to receive a copy. This has been made possible through the dedicated work of individuals from labor, industry, government, and education. These groups have cohesively worked to derive the skill standards a HazMat technician needs when they complete a training program and enter the workforce.

The primary outcomes of this project were identified as follows:

1. Select an advisory group
2. Organize and conduct regional focus groups
3. Develop a survey instrument to prioritize tasks required by a HMMT based on the information obtained from the advisory group and focal groups
4. Validate the tasks/skills list through the advisory committee

5. Develop a means to distribute the survey to hazardous materials experts (labor, industry, government, education) for their input and validation
6. Disseminate the information to interested industries, schools, and training providers.

The activities are enumerated only for ease of description, The activities and certification discussion are of equal importance to the success of the process and the desired outcome.

Activity 1: Selection Of The Advisory Committee

A general advisory committee has been formed and is composed of a diverse group of qualified individuals representing industry, government, professional organizations, labor, large and small businesses, and educational institutions.

The purpose of this committee is twofold;

1. Provide advice and guidance for the project;
2. Aid in the development of job level descriptions for the skills and behaviors needed by employees who handle and manage hazardous materials in industry.

Although the selection of members is very diverse, representation from small business has been very limited. Jim has worked very diligently to encourage their participation in all phases of this project.

Activity 2: Organize and conduct regional focus groups

Focus groups were conducted around the nation to assist in the identification of regional variations in HMMT requirements. Five focus group meetings were held in conjunction with HazMat related organizational meetings and held at the following locations:

Seattle, Washington: February 22, 1994
Miami, Florida: March 8, 1994
Albuquerque, New Mexico: March 11, 1994
New Orleans, Louisiana: April 6, 1994
Hagerstown, Maryland: June 6, 1994
New Orleans, Louisiana: June 12, 1994

The purpose of this process was to get representation from all of geographical regions of the country. A meeting was not held in the middle of the country, but participants from this area were able to attend other meetings.

Activity 3: Develop a survey instrument

A draft of a survey instrument was developed and pilot tested at the April 6, 1994 focus meeting in New Orleans. This was extremely helpful because a vast amount of information was obtained and the survey was modified to incorporate the suggested changes.

On June 6, 1994, in Hagerstown, MD, a second draft of the survey was used at the regional focus group meeting to ensure the skills of the HMMT were accurate.

Then, the survey was used at a meeting in Fort Worth, Texas on June 17, 1994. This meeting was jointly sponsored by CORD and the National Environmental Health Association, NEHA. This date was scheduled because it was the day prior to the beginning of NEHA's national conference which would increase the attendance and participation of individuals at this meeting.

At the meeting there were 20 individuals from industry, government, professional organizations, and educational facilities. The primary emphasis of this meeting was to review the draft survey which identified the key skills a HMMT would need to be able to perform. These skills were identified by 11 areas with specific tasks listed in each of the areas. The 11 areas are as follows: regulations, recordkeeping, identification and labeling, emergency response, transportation and storage, treatment and disposal, training, sampling and analysis, safety, equipment, chemical and physical hazards.

A process similar to a Delphi was use for this exercise. The participants were divided into groups which corresponded to the focus areas of a HMMT: compliance, remediation, laboratory/analysis, and treatment, storage, and disposal (TSD). The participants selected the group they felt they were "expert" in and represented this during the day. Each group reviewed the 15 page survey and identified several items. First, was the described activity actually performed by a HMMT in that specialty area. If the task was not performed, it was deleted from the list. Second, was the underlined verb the correct one to describe the task. If the verb was inappropriate, then another verb was selected which proved to be more representative of the expertise needed by the HazMat technician.

After the activities were verified for accuracy and description, they were given a value of one, two, or three; one representing the most important activity.

At the end of the day, all of the information was given to Reggie Moore of NEHA who took the information and formulated it into a questionnaire that will be distributed in August. A draft of this was available for the July 14, 1994 meeting in Waco, Texas.

Activity 4: Validate the tasks/skills list

In Waco, a draft of the survey was reviewed by Jim Johnson, Project Director. Jim made several suggestions and Reggie incorporated the changes into the finalized survey. Then Reggie sent a draft of the survey to all of the individuals who were in attendance at the July meeting. These attendees then sent a copy of the draft to a representative group of individuals in their geographical area to review, comment, and made suggestions to ensure completeness of the survey prior to general dissemination. The information obtained from the draft was returned to Reggie by August 1, 1994. Reggie incorporated these changes into the final survey which will be mailed out the middle of August.

Although this type of process takes a considerable amount of time and effort, it provided an excellent format to ensure completeness of the questionnaire.

Activity 5: Develop a means to distribute the survey

Several methods will be used to obtain validation of the skills standards. All skills standards advisory committee members and members of the following professional/educational organizations will receive a copy of the survey to complete. The organizations include:

1. Partnership for Environmental Technology Education, PETE; all of the participating schools,
2. National Environmental Health Association, NEHA; those individuals who are part of the HazMat specialization area,
3. National Association of Environmental Professionals NAEP,
4. Hazardous Materials Control Resources Institute, HMCRI; those individuals who are part of the HazMat specialization area,
5. National Environmental Training Association, NETA; those individuals in the HazMat specialization area.

NEHA is responsible for mailing the survey to the HazMat members of NEHA, PETE, NAEP, HMCRI, and NETA. In Waco, it was determined that PETE, HMCRI, and NEPA will provide mailing labels and a cover letter to be included with surveys that are mailed to their respective HazMat members. Those individuals who are members of the Hazardous Materials section of NEHA will obtain a copy of the survey.

The goal is to receive a minimum of 200 completed surveys from the different organizations. This goal is reasonable and will provide a good basis from which the specific standards can be obtained.

Activity 6: Disseminate the information

The Skills Standards will be disseminated at a seminar on October 3-4, at the Roney Teaching Center in Waco, Texas.

Certification

An issue that has been discussed as a companion to the skills standards is the concept of certification for HMMT. During the meeting in Waco, the need and benefit of a certification process was discussed. Several organizations were present to discuss how their certification process works. The organizations that presented included:

NETA: Rick Richardson
NEHA: Reggie Moore
NAEP: Jim Talley
HMCRI: Dan McGrew
BCSP, ABIH, CHMM: Jean Drevdahl

The afternoon focused on understanding different examples of licensing and certification in other related organizations. Alan Sosbe of CORD discussed the certification process for the Automotive Service Excellence. Jean presented information on the licensing process for registered nurses and certification for occupational health nurses.

Following these presentations Valerie Sherwood discussed topics to be aware of when you are evaluating occupational skills and certification processes from her experience in England. Based on the information that the group received during the day they felt it was very important to have a certification process to certify individuals who graduate from a HazMat program and one to certify the educational institutions.

Friday focused on developing a certification process. The group divided into two teams and each team came up with their idea of how a certification process should be organized. Out of the groups came a suggested certification process for individual HMMT and educational facilities.

Project Manager's Meeting

On July 21 and 22, Jim Johnson HMMT Project Director and Jean Drevdahl attended the Director's meeting in Washington, D.C. The meeting commenced with a presentation by Dr. Augusta Kappner. After her remarks, there was a presentation from Dr. Brian Shea from the Training Technology Resource Center, TTRC, This session demonstrated the computer search abilities that TTRC can perform. This also showed how we can access the information that is on-line.

In the afternoon, the group broke into four work sessions. Each session reported on how their project was going as a means of identifying the similarities and differences. It was very interesting to see that most of the projects had more similar experiences than differences. This was a very powerful session since it gave us time to look at our project and integrate some of the strengths from the other groups into the HazMat arena.

Summary

The Hazardous Materials Management Technician, HMMT, project is progressing very well. A modified Delphi technique was used to identify the key competencies for a HMMT. The benefit of this type of study is that it allows the integration and validation of the skills by numerous individuals and organizations prior to sending out the final survey. This process will help to ensure that the identified skill standards represent what a HMMT does after graduating from a HazMat program.

The next challenge is to finalize the survey into a format that is easy to understand and complete. Jim Johnson made a tactical decision to involve National Environmental Health Association, NEHA in the process of formatting, distributing, and analyzing the survey. This was a very wise decision since NEHA is very involved in this field and has the expertise within their organization to format the questionnaire and tabulate the results in a rapid manner.

Distribution of the survey is key to ensure that those who receive it will be representative of the workers in the field. At the Waco meeting in July, the distribution list was expanded to include several organizations who are involved in the HazMat area. Although this step may take more coordination by NEHA with the other organizations, the final product will be well worth the effort because the distribution will be more broad based and not limited to those individuals who are members on only one organization which could bias the results.

As with any survey, the greatest challenge still remains; ensuring completed surveys are returned by the designated deadline. The goal is to receive at least 200 completed surveys. This number would provide the responses from which the standards will be based on. This could require additional follow up since the survey will be distributed during August which is typically a vacation month. I would recommend that some process be developed to follow up on surveys that are not returned. This follow up could include post-cards, phone calls, or reminder letters.

After the results have been tabulated, the information needs to be distributed to those individuals, organizations, and institutions that participated in the process or are interested. A meeting is scheduled in October to review the results of this project. In addition, I would recommend that the results be published in the HazMat journals.

A topic for further investigation would be to determine how many of the institutions that have HazMat programs teach all of the tasks that are identified in the skill standards. If several of the tasks are not routinely taught, developing some means of assistance for these schools would help to ensure that the skill standards are being integrated into the HMMT programs. This could include developing curriculum, reference materials, or even table top exercises.

Another topic that will be evaluated in the future is the process of certification. Jim is progressing very well on this area since he conducted one meeting to look at the potential format to follow. This is excellent since it is optimistic to expect it to be completed in three years, and Jim is well on the way after only 18 months.

The HazMat field is very dynamic, therefore the skill standards will need to be evaluated in the next five to ten years to see if what is developed in 1994 is representative of what the technician is doing in 1999 or 2004.

It has been a pleasure working on this project with Jim Johnson. Jim brings an enormous amount of enthusiasm, expertise, and project management skills to this area which are reflected in the results that are being produced by this project.

Hazardous Materials Management Technicians Skills Standard Project

Remediation—Lois George

REMEDIATION

Lois D. George
P.E. LaMoreaux & Associates, Inc.

REMEDIATION/OVERVIEW

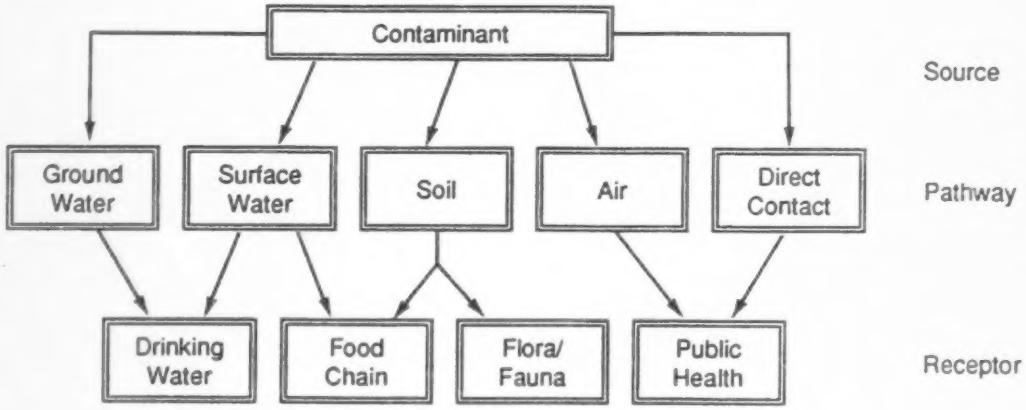
Definition

Objective

Media

- Groundwater
- Surface water
- Air
- Soil

Potential Pathways and Receptors for Contaminant Migration


Contaminant
Source
Ground Water
Surface Water
Soil
Air
Direct Contact
Pathway
Drinking Water
Food Chain
Flora/ Fauna
Public Health
Receptor

Methods

- Source Control
- Groundwater Control

REMEDIAL TECHNOLOGIES

TECHNIQUE	PURPOSE
Ground-Water Control Technologies	
Capping (soil, synthetic)	Reduce infiltration and thereby minimize leachate generation
Ground-water pumping and treatment (air stripping, activated granular charcoal, UV/ozonation)	Collect and control leachate for treatment in on-site or off-site system
Impermeable barrier (survey wall, grout curtain, sheet piling, French drain)	In downgradient position - limit contaminant migration; In upgradient position - divert ground water away
Subsurface collection drain	Intercept and transport contaminants
Surface-water diversion and collection (dikes, berms, ditches, and benches)	Intercept and divert runon and thereby reduce potential for infiltration and leachate generation
Permeable treatment bed	Adsorb, neutralize, or precipitate contaminants
Grading	Promote surface runoff, reduce infiltration and thereby reduce leachate generation
Revegetation	Indirectly reduce leachate generation by drying surface layers through root uptake
Bioreclamation	Degrade/remove organic compounds
Soil and Sediment Control Technologies	
Capping	Isolate waste materials, control off-site transport of contaminated sediment on soils, supplement vegetation, prevent leachate seeps
Grading and revegetation	Control erosion
Surface-water diversion and collection (dikes, berms, ditches, trenches, and benches)	Intercept and divert runon, slow runoff, control erosion, trap and collect sediments
Leachate control	Collect and treat leachate
Excavation and removal	Remove source of contamination

Surface-Water Control Technologies

Capping	Isolate waste materials, control off-site transportation of contamination, support vegetation, prevent leachate seeps
Grading and revegetation	Provide non-erosive runoff by shaping topography, support vegetation, control off-site transport of contamination
Surface-water diversion and collection (dikes, berms, ditches, trenches, and benches)	Intercept and divert runon, erosion control, channel contaminated runoff
Seepage basin	Collect runoff and provide recharge
Sediment basin (check dams, basins, ponds)	Collect contaminated sediment/soil
Leachate control	Collect and treat leachate
Surface-water treatment (air sampling, activated granular charcoal, UV/ozonation)	Treat at on-site or off-site facility

Air/Soil Pore Space Control Technologies

Capping	Provide impermeable barrier for upward migration/surface escape of decomposition gases and volatiles
Gas ventilation (pipe or trench vents)	Prevent lateral migration of gases, vent to atmosphere or to treatment or collection system
Gas collection and treatment	Remove, destruct, or collect air pollutants
Gas barriers	Prevent lateral subsurface migration of gases

Source Control Technologies

Mechanical excavation	Remove waste from the site for treatment or secured disposal
Land disposal	Dispose waste material in an approved and secured landfill
Incineration	Thermally oxidize waste material in controlled on-site or off-site environment
Solidification	Incorporate waste material with impermeable substance
In-situ solidification	Inject solidification agents directly into waste site

In-situ neutralization/detoxification	Neutralize or immobilize waste by application of neutralization agent such as lime to the waste material
Microbial seeding	Biodegrade organic waste
Gas injection/gas extraction	Control and remove gas in soil/waste
Soil flushing	Remove contaminants from soil

Institutional Technologies

Alternate water supply	Prevent public exposure
Environmental monitoring	Continued monitoring to track remediation processes
Access restrictions	Prevent public exposure

INVESTIGATION

Tasks

- Topographic mapping
- Geophysical surveys
- Soil/water/air sampling
- Well Installation
- Laboratory Analysis
- Data management/interpretation/presentation

Skills

- Surveying
- Operating equipment/maintenance and repair
- Sample collection and documentation
- Drilling
- Laboratory testing/field testing
- Computer

Tools/Equipment

Field Equipment

- Altimeter
- Audio-visual camera
- Bailers (various materials and sizes)
- Biological sampling equipment
- Brunton compass
- Data logger
- Field chemistry kit
- Generator
- Hand auger/power auger
- Kemmerer sampler
- Laptop computer
- Microbarograph
- Microscope
- Rain gage
- Submersible and jet pumps
- Water filtration unit
- Water-level recorder/ water-level indicator
- Conductivity meter
- Current meter
- Dissolved oxygen meter
- Fluorometer
- Geiger counter
- pH meter
- Soil pH meter
- Turbidimeter

Geophysical Equipment

- Seismograph
- EM conductivity
- Ground penetrating radar
- Metal detector
- Borehole logger

Analytical Laboratory Instruments

Hazardous Materials and Safety Equipment

- Air purifying respirator
- Coliwasa sampler
- Combustible gas/oxygen meter
- Decontamination equipment
- Disposable eye wash
- Disposable gloves
- Draeger air monitors
- Eye wash/body drench
- First-aid kit
- HnU meter, photoionization detector
- Material safety data sheets
- Metal detector
- Organic vapor analyzer, flame ionization detector
- Oxygen supply
- Poly-coated Tyvek covers
- SCBA (self-contained breathing apparatus)
- Soil sampler, auger
- Stainless steel and Teflon bailers
- Stainless steel and Teflon soil and sludge samplers

REMEDIATION

Tasks

- Soils removal
- Installation of wells and pumping system
- Trenching/utility installation
- Trenching and install rock
- Trenching and install grout
- Site safety
- Installation of monitoring equipment
- Installation of computer system
- Soil/water/air sampling
- Laboratory Analysis
- Data management/interpretation/presentation

Skills

- Map and plans reading
- Operating equipment/maintenance and repair
- Sample collection and documentation
- Drilling
- Laboratory testing/field testing
- Computer
- Operating machinery
- General carpentry
- Wiring

Tools/Equipment

- Air purifying respirator
- Coliwasa sampler
- Combustible gas/oxygen meter
- Decontamination equipment
- Disposable eye wash
- Disposable gloves
- Draeger air monitors
- Eye wash/body drench
- First-aid kit
- HnU meter, photoionization detector
- Material safety data sheets
- Metal detector
- Organic vapor analyzer, flame ionization detector
- Oxygen supply
- Poly-coated Tyvek covers
- SCBA (self-contained breathing apparatus)
- Soil sampler, auger
- Stainless steel and Teflon bailers
- Stainless steel and Teflon soil and sludge samplers

- Analytical Laboratory Equipment

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- Trencher
- Bobcat
- Backhoe
- Excavator
- Grader
- Dozer
- Vacuum truck
- Generator
- Pumps
- Compressors
- Spill prevention/control tools and supplies

STANDARDS

EPA

The last major environmental statute passed is the Resource Conservation and Recovery Act (RCRA), 1976, and amended in 1984. The law is divided into eight subsections. The three subsections of primary importance include provisions to regulate solid waste (Subtitle D), hazardous waste (Subtitle C) and underground storage tanks (Subtitle I). The law was originally drafted as a solid waste recycling and disposal law to eliminate open dumps; however, implementation was focused on regulating hazardous wastes.

The Comprehensive Environmental Response, Compensation and Liability (Superfund) Act (CERCLA) passed in 1980 provides the federal program for cleanup of abandoned waste disposal sites and ground-water contamination.

The Superfund Amendments and Reauthorization Act (SARA) of 1986 establishes "right-to-know" on releases to environment, requires states to establish emergency response districts with comprehensive emergency response plans.

OSHA

The Occupational and Safety and Health Act (OSHA), enacted in 1970, is the primary Federal law regulating toxic substances to protect workers in the work place. The law was passed as the result of increased public concern about work place hazards and the effects of exposure to hazardous chemicals. Before passage of the law, worker safety was the responsibility of State agencies and labor groups. OSHA has promulgated the regulations to cover the training and working conditions requirements of SARA.

DOT

Hazardous Materials and Transportation Act, 1975, gives the DOT authority to regulate the shipment of substances that may pose a threat to health, safety, property, or the environment when transported by air, water, rail, or highway.

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Hazardous Materials Management Technicians Skills Standard Project

Laboratory—Roger Wise

Hazardous Materials Management Technicians Skills Standard Project

Compliance—Steve Wiederwax

Hazardous Materials Management Technicians Skills Standard Project

Compliance—Krastie LaRue

Hazardous Materials Management Technicians Skills Standard Project

Transportation—Bruce Rodgers

Educational Considerations for the Environmental Technician Focus: Energy-Transportation Industries

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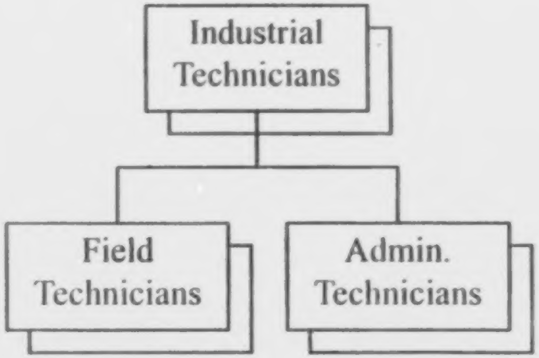
Areas of Critical Need



Industrial Technicians

Field Technicians

Admin. Technicians

What Makes an Outstanding Field Technician

- Applied Natural Science Background
- Field Methods Training
- Details Training
- Logistics Juggling

Field Technician Attributes

- Natural Science Background; Applied:
    - Chemistry
    - Hydrogeology
    - Meteorology

Field Technician Attributes

- Field Methods Training
    - Map and Aerial Photograph Utilization
    - Background Data Instrumentation
        - Wind/Temperature/Humidity
        - Barometer/Altimeter...Compass/Clinometer

Field Technician Attributes

- Field Methods Training
  - Sampling Equipment for Various Media
    - Soils/Rocks...Air
    - Surface Water
    - Ground Water
    - Wipe Samples
  - Industry Smart

Field Technician Attributes

- Details Training
    - Contamination Concerns
        - Personal/Samples/Site
    - Documentation Concerns
        - Legal Credibility
        - Professional/Personal Credibility

Field Technician Attributes

- Logistics Juggling
    - Appointments & Scheduling
    - Permit Sampling
    - Submission Deadlines

What Makes an Outstanding Administrative Technician

- Regulatory Agency Savvy
- Information Control
- Logistics Juggling

Qualities of an Administrative Technician

- Regulatory Agency Savvy
  - How Regulations are Structured
    - Federal/State/Local
  - Freedom of Information
    - Getting into Agency Files & Records
  - Getting Information Without Disclosing Too Much

Qualities of an Administrative Technician

- Information Control
  - Computer Literate
    - Word Processing/Spreadsheet
    - CD Rom/Public Access
  - Document/Data Retention
    - Future/Historical Implications
    - Legal Implications

Qualities of an Administrative Technician

- Logistics Juggling
  - Permit Deadlines
    - Time Sensitive Reporting
    - Permit Renewal Lead Times
  - Rapport with the Agency Representative

Common Needs

- Honest
- Dependable and Safe
- Representative of the Corporation's Image

Specific Training Certificates

- OSHA 40 Hour Hazardous Waste Site or HAZWOPPER Training
- Hazardous Materials Handler Training
- Opacity Certificate

Where is the Energy-Transportation Fit?

- Property & Facility Acquisitions and Sales
  - Historical Research and Data Collection
    - Natural Science
    - Field Methods
    - Details
    - Regulatory Savvy
    - Information Control

Property Maintenance and Facility Operations

- Short-Term Response
  - Certificate Training
  - Information Control
  - Details Training
  - Logistics Juggling

Property Maintenance and Facility Operations

- Long-Term Monitoring
  - Field Methods
  - Details Training
  - Information Control

Facility Compliance

- Permit Performance
    - Logistics Juggling
    - Field Methods
- Regulatory Performance
    - Details Training
    - Applied Natural Sciences
    - Information Control

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THE DEVELOPMENT OF A SKILLS STANDARD

FOR

HAZARDOUS MATERIALS MANAGEMENT TECHNOLOGY TECHNICIANS

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September 20, 1994

The Development of a Skills Standard For Hazardous Materials Management Technology Technicians

During the past decade we have witnessed a phenomenal growth in the concern for the environment. This growth, as a result of ever-increasing federal, state, and local regulations and restrictions, has led to the development of numerous employment opportunities. For the most part, the employment opportunities have been filled by professionals who have—for lack of a better term—grown up with the industry. However in recent years, as the regulations and procedures have become more standardized and routine (and concern for the minimization of costs in a competitive market place have increased), many of the responsibilities undertaken by professionals have been transferred to technician-level personnel. This transition from professional to technician-level personnel has developed an opportunity for the education and training of individuals with specific skills and caused the federal government to recognize the need for the development of a measurable Skills Standard for these individuals.

The United States remains the only major industrialized nation that is without standards to define the skills required for industrial occupations. With few exceptions, our schools have been preparing people for vocations with only vague job descriptions to guide them. Schools can only guess at the demands of a particular occupation as there are presently, in most cases, no nationally-based norm, called a SKILLS STANDARD. For the most part, schools have made this guess with the help of a small number of localized industrial representatives. This has limited the effectiveness of schools in developing programs that meet the needs of industry beyond a specific, locally recognized need. It is little wonder that schools receive criticism for producing students who cannot function in an entry-level position without needing long periods of on-the-job training before they become productive employees. Additionally, as the needs of industry for qualified, knowledgeable technicians has increased during the past decade, the opportunities for schools to develop such programs has increased.

The current administration's educational initiative is designed to combat this dilemma and other educational problems. A multifaceted program referred to as "Goals 2000: Educate America" has as one of its top priorities the development of SKILLS STANDARDS for certain key occupations. A skills standard is a definition of the knowledge, skills, attitudes, and level of ability that are necessary to successfully function in the occupation. At this time, twenty-two different occupational Skills Standardsdevelopment projects are in process. In addition, other projects are underway that will eventually identify and standardize foundational skills needed for all occupations. These skills are identified in the Secretary's Commission on Achieving Necessary Skills report relating to technical and interpersonal skills. Since occupational Skills Standard are a new concept in this country, there is no uniform or developmental process for them.

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Guidelines for the development of Skills Standards are generally accepted as follows:

1. Skills Standards must be voluntary,
2. They must be industry-based,
3. The occupation must be explored and defined in detail,
4. A coalition consisting of representatives from industry, business, and education must lead the development and validate the final result,
5. A list of tasks and associated skills must be disseminated, discussed, debated and modified by experts in the field until a consensus is reached and the list is recognized as a "standard."

The advantages of having Skills Standards include:

1. Employees will have a clear picture of what they have to be able to do in order to be successful in the occupation.
2. Training providers can be held more accountable since a clear set of performance expectations will be outlined.
3. Skills Standard will make United States businesses more competitive in the global marketplace, since workers will have an understanding and level of ability that will equip them to perform tasks successfully.
4. Educational institutions and curriculum developers will have a clearly defined target that industry has provided.
5. Less emphasis will be placed on a degree and more emphasis placed on job-related skills.

In recognition of the need for qualified entry-level personnel in this area, "Goals 2000: Educate America" includes the development of a Skills Standard for Hazardous Materials Management Technology (HMMT) technicians. In the development of this standard a national advisory committee has been assembled to guide the project. The committee, consisting of 49 representatives (including representatives of various regulatory agencies), provides several different viewpoints. The composition of the advisory committee is shown in Table 1.

Hazardous Materials Management Technology
Skills Standard Project

National Advisory Committee Membership

Industry	13
Consultant/Remediation	7
Municipal	2
Unions	3
Societies	6
Government	2
Military	3
Colleges (Two- and Four-Year)	13

Table 1

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This advisory committee has been commissioned by the federal government with the task of answering fundamental questions, such as:

> Is an HMMT technician the person who responds to an emergency like a chemical spill or a fire? Or is that person a "firefighter" with some special skills?
>
> Does an HMMT technician work with short-term emergency response, the clean-up or remediation of contaminated sites, or work on long-term pollution-prevention projects?
>
> Does an HMMT technician need to possess knowledge of chemical hazards only, or is a knowledge of nuclear and/or biological hazards also expected?
>
> How completely does an HMMT technician need to know the federal, state, and local environmental laws?
>
> Does this person interpret regulations and apply them to a specific situation, or does the HMMT technician fill out and submit reports to various agencies?

Within the field of HMMT are different occupations which require different skills related to hazardous materials management. In some environmental occupations, a HMMT technician needs only a limited set of hazardous materials management skills while in other occupations a much more rigorous set of skills is required. Indeed, some occupations may even require that an HMMT technician obtain specialized skills in related occupational areas such as safety and health, management, regulations, laboratory operations, remediation, etc. This concept is illustrated in Figure 1 which begins by showing that all technicians need foundational skills related to communications, mathematics, science, logical reasoning and interpersonal relations. As occupational skills are acquired, a person may be employable in some hazardous materials management occupations even though that person does not have all the skills required to become a HMMT technician.

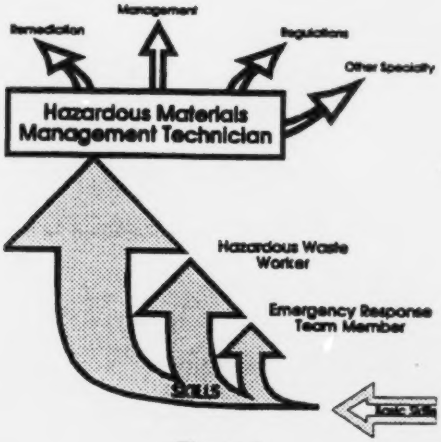

Figure 1

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The definitions of HMMT vary depending on the needs of the prospective employer. Since it is a subset of the more general category of Environmental Science, it is instructive to explore some of the history of the development of this field.

Although employment in the environmental industry has begun to flatten out recently[1], in our opinion, the outlook still remains strong for opportunities in the field of Environmental Science. Environmental Engineering curricula at major colleges and universities across the United States used to be primarily a subsection of the Civil Engineering departments, providing a specialty in water-waste treatment and design (WWT/D). However, in the past several years, institutions of higher learning are beginning to place the Environmental Engineering curricula on its own as stand-alone departments of Environmental Engineering. The need for environmental technicians has paralleled the need for environmental engineers.

Qualified HMMT technicians are still receiving their training on the job. According to one study, on the whole "technicians (which, although not identified as such, includes HMMT technicians) get more education and training in preparation for their jobs and upgrading once they are on the job than any other occupational group ..."[2]

The authors of this paper have hired and trained four, non-professional HMMT technicians in the last four years due to the expansion of the industry. In each case, the resumes obtained as a result of our advertising for these positions were divided between those who were over-qualified with baccalaureate and masters degrees in engineering and geology and those who had no previous experience or education that would have qualified them prior for employment. The over-qualified people were not considered, which meant that it, therefore, became necessary to immediately send the individuals eventually hired to various seminars and training courses and to spend a great deal of time with them in the field in order to provide them with the necessary skills to perform their work.

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[1] Camardo, Susan, "Carving Your Niche in the Environmental Industry, *Peterson's Job Opps '94, The Environment*, Peterson's Guides, Princeton, N.J: 1993.

[2] Carnavale, Anthony P., et al, *Training the Technical Work Force*, Jossey-Bass, Inc., Publishers, San Francisco, CA: 1990, pg. 3.

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HMMT Technician Defined

So, what is an HMMT technician and how does this individual fit into the field of Environmental Science? In differentiating technicians from technical professionals (that is to say, doctors, engineers and scientists), Anthony Carnavale, et al, states:

> Technicians include employees whose primary expertise lies in a particular technical specialty area. While technicians have a considerable depth of knowledge and highly developed skills in their areas of expertise, they generally lack the breadth of knowledge in the theoretical aspects of their specialties that is required of technical professionals. Although many technicians are graduates of four year colleges, many have developed their skills and knowledge through technical or vocational schools, community colleges, or on-the-job training. After technical and non-technical professionals, technicians are the most highly educated and well-trained employees in the American workforce.

Technicians usually receive training that applies directly to their jobs. This training has its basis in theory but is focused more directly on the application of theory to the job than is training for technical professionals.[3]

According to the Dictionary of Occupational Titles (Chronicle Guidance Publications, 1985, pg. 4.), HMMT technicians are individuals who:

> ... provide information and advice on ways to collect, transport, handle, store, and dispose of toxic wastes. They help monitor and direct the cleanup of land, water, and air. These technicians survey industries to learn what disposal methods they use. They look at hazardous waste treatment disposal from the standpoint of both effectiveness and cost. From their findings, they make recommendations for ways to collect, move, store, treat, and dispose of wastes. They offer advice and technical aid to members of industry and government.

To help protect people and the environment, HMMT technicians, especially those who work for the state or federal government, draft rules and regulations for handling hazardous waste. They also help develop programs to prevent spills of hazardous waste. They review company or agency plans for spill prevention, and they suggest changes in those plans. They help develop regulations for the reporting of spills and for measuring environmental damage caused by those spills.[4]

We submit that HMMT technicians are highly skilled and knowledgeable individuals who are trained to use technical applications of theory to specific tasks. As such, they may work with professionals who are trained in the understanding of theory to develop and implement tasks that relate to the field of Environmental Science. This is not to say that HMMT technicians do not have an understanding of the theoretical concepts, only to imply that their experience and training is directed more toward the implementation of the theory than the actual concepts behind the practice itself. As such, HMMT technicians fall well within the field of Environmental Science as a major, necessary, and highly employable subset.

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[3] ibid., pg. 11.

[4] Hudis, Paula M., et al, "Educational Needs and Employment Trends of Environmental Hazardous Materials Technicians and Related Workers," National Center for Research in Vocational Education (NCRVE) University of California at Berkeley, Berkeley, CA: December 1992, pg. 71.

Tasks Performed by HMMT Technicians

This project defines areas of specialization for HMMT technicians. The tasks performed can span a range of activities.[5] Because of this multiplicity of tasks, in order to provide some parameters, the Advisory committee has *arbitrarily,* based on our experience, grouped the activities of an HMMT technician into the following four subsections:

1. Laboratory/Analytical Technicians (LAT): The primary area of specialty and focus for this individual is the analysis and testing of chemical compounds in a laboratory setting. The tasks this person may be required to undertake may range from the initial preparation of samples for analytical testing to the operation of complex and highly sensitive instrumentation.

2. Compliance/Regulations Technicians (CRT): This individual's primary area of specialty and focus is in the interpretation and implementation of regulations to ensure compliance of the same in industry. The tasks this person may be asked to undertake may range from inspection to enforcement, and to the writing of new regulations as needs arise and situations change.

3. Field Operations/Remediation Technicians (FORT): The FORT's primary area of specialty and focus is in the practical aspects of working with chemical, biological and nuclear hazards and materials in the field. The tasks this person may be asked to undertake may range from the collection of samples, data and information to the design and implementation of remedial and corrective actions.

4. Transportation/Storage/Disposal Technicians (TSDT): This individual's primary area of specialty and focus is in the methods and techniques for safe, effective and efficient treatment, storage and disposal of chemical, biological and nuclear materials and wastes. The tasks this person may be asked to undertake may range from the handling of hazardous materials and wastes to the design and implementation of effective treatment and disposal methods.

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[5] ibid., pg. 70.

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A Typical Day in the Life of a HMMT Technician

As previously stated, the tasks performed by an HMMT technician can span a wide range of activities. The above groupings have been arbitrarily arrived at in an effort to provide some parameters for this assessment. Based on our experience in working in the field, we recognize that to attempt to finely divide the tasks performed into one category or another is impractical. These individuals are called upon by their employers to be multifaceted, and there is no such thing as a typical day in the life of any of the above-stated groupings of individuals.

However, borrowing from the approach described by Paula M. Hudis, et al,[6] there do appear to be some broad ranges of activities under which the activities of our groupings for HMMT technicians may fall. In that light, we offer the following matrix as an understanding of the tasks they may be called upon to undertake in a typical day.

ACTIVITY	HMMT TECHNICIAN			
	LAT	CRT	FORT	TSDT
Remediation	*	*	**	**
Corrective Activities	*	**	*	*
Waste Treatment and Management	*	*	*	**
Source Minimization and Recycling	*	*		**
Disposal Activities	*	*	*	**
Monitoring Activities	*	*	**	*
Transportation Activities	*	*	*	**
Emergency Response Activities	*	*	**	*

* Area of Specialization ** Primary Area of Specialization

Figure 2

HMMT Specialties and Where Employment is Anticipated

The Environmental Industry

While the rate of employment in the environmental industry is flattening, in our opinion the outlook still remains strong for employment opportunities in the field of Environmental Science. Susan Camardo, writing in *Peterson's Job Opps '94,*[7] states that the environmental industry "had been riding high in the mid to late 1980s, with growth estimated at anywhere from 16 to 30 percent per year. But about two years ago, the growth rate slowed dramatically, to 2.1 percent in 1991 and 3.9 percent in 1992. Grant Ferrier, editor of *The Environmental Business Journal,* predicts that the industry will remain flat throughout 1993, with an upturn starting in 1994. He doesn't see the environmental industry returning to its former double-digit growth levels but projects that growth over the next five years will average 5 to 7 percent." Ms. Camardo offers several reasons for the slowdown of the environmental industry. These include: 1) the maturation of the industry, 2) the increase in competition, 3) a shakeout and consolidation of companies within the industry, and 4) the postponement of environmental spending by industry due to prevailing economic forces. However, she notes that a steady increase in the number of jobs in the environmental industry over the past several years has been charted by others. In 1988, there were 793,159 jobs. This number has changed to 1,073,397 as of 1992. The expectations are that the employment figure will rise further to 1,327,150 jobs in 1997.

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[6] ibid., pp. 71-74.

[7] Camardo, pp. 6-7.

Ms. Camardo indicates that the "industry segments that look particularly strong in the near term are:

- Environmental energy sources (solar, wind, geothermal, and other forms of alternative energy)
- Air pollution control (air quality management, equipment manufacturing)
- Resource recovery (post-consumer and post-industrial recyclers and scrap dealers, waste-to-energy plants)
- Waste management
- Environmental testing and analysis
- Environmental consulting

The most sluggish segment is expected to be asbestos abatement, due to continuing softness in commercial real estate sales, which historically account for a third of this segment's market."

In discussing the "*Industry of Tomorrow*," Ms. Camardo states:

> Perhaps the most important trend experts see developing is a shift in the forces driving the environmental business. Up to now, growth has been fueled by corporate America's needs to comply with extensive and often complex environmental regulations … As a result, firms specializing in environmental cleanup, especially those in the waste management area, have made up the largest and strongest part of the industry. And the price tag for this cleanup has been tremendous.
>
> But now, more and more attention is being focused on the other side of the environmental equation—prevention. Not only is this a necessary step to take in the preservation of the planet, but it also makes good business sense. Pollution prevention relies on using more efficient processes to reduce wastes while producing more product per unit of raw material ....
>
> Jeffery Leonard, president of the Global Environment Fund, L.P., which focuses on investments that promote environmental improvement, estimates that more than half of United States environmental spending by the year 2000 will spring from non-regulatory factors rather than anti pollution laws. According to Michael Silverstein of Environmental Economics, "The real action is going to be in avoiding environmental expenditures rather than making them."
>
> ... One thing is certain—*whatever form they take, environmental jobs are here to stay.* (emphasis ours) …

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Potential Environmental Employers[8]

Based on our observations and the sources we consulted for this paper, potential environmental employers appear to fall into two broad categories: Those who provide environmental services and those who generate hazardous wastes and materials.

Environmental service "includes companies that provide private firms and government entities with environmental waste management, hazardous waste removal, and environmental management services as well as related laboratory and environmental equipment services. These firms reportedly represent a $132 billion business in the United States, employing about 814,000 workers."

Those who generate hazardous wastes and materials include businesses and industries that "are rarely classified as environmental entities. Instead, they may include manufacturers, agricultural processors, mining operations, public utilities, and national energy laboratories. These hazardous waste generating organizations employ about as many individuals in environmental jobs as do environmental services firms. In combination, these two sectors of the environmental industry include nearly two million American workers, about 1.5 percent of the employed civilian workforce."

Related to Our Subgroups

If, as previously reported, the trend in the next several years will be away from remedial activities and toward prevention, it would seem obvious that all the subgroups we have identified would benefit.

It may be less obvious that the FORT subgroup will find the possibilities of employment increasing at the same pace as the other three subgroups. However, we contend that this group will see an increase in employment, as well. Few of the Superfund sites in the United States have been remediated since Superfund's inception in 1986. In the state of Florida alone some have estimated that over 10,000 underground storage tanks exist. Of these, it has also been widely estimated that approximately one-quarter are leaking their contents into the surrounding environment. At an industry-wide accepted standard of $150,000 to $250,000 to effectively remediate a site involving underground storage tank discharges, a total of between $375 million and $625 million could be required to clean up the contamination present from these sites alone. Presently, the state of Florida has been setting aside approximately $19 million each year for the clean up of sites contaminated by leaking underground storage tanks. Even doubling or tripling the annual amount of dollars available from the state of Florida would not begin to significantly decrease the number of years it would take to remediate these sites.

Based on our experience, we have learned that each situation, while different, is not necessarily unique. Therefore, while underground storage tank cleanup may not be the major concern in another part of the United States, we assume that other situations and conditions exist elsewhere that will be of vital concern on a per capita basis to that area. Therefore, we assume that FORT opportunities will continue to exist in the foreseeable future.

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[8] Hudis, Paula M., et al, pp. 67-68.

In regard to the two major potential employers identified earlier, we expect that the services of all four subgroups will be required by both segments. This expectation is based on the activities that we have defined for these subgroups and the inter-related needs of the two segments of potential environmental employers.

Principle Skills Required for Each Subgroup

The principle skills required for technicians in each subgroup as we have defined them are not to be confused with those skills which we consider to be basic skills such as written and verbal communication skills, teamwork and physical ability. The principle skills consist of those skills which are necessary on a higher level so that the HMMT technician can effectively perform the tasks required.

As seems obvious from Figure 2, the tasks each subgroup HMMT technician may be required to undertake in a typical day overlap the tasks of the other subgroups. That is to say, none of the subgroups appears to be able to claim sole ownership of the activities offered. In our estimation, this means that the principle skills must be shared across the subgroup boundaries. It does seem obvious that the LAT should possess a well-developed principle skill level in laboratory testing techniques. However, it is also apparent that the FORT should possess an understanding of and appreciation for laboratory practices in order to provide the LAT with a sample for analysis or to develop a sampling program.

In short, what we are saying is that, while each subgroup may find it necessary to develop a keen understanding or skill level in a particular area, it is also necessary for the subgroups to share common abilities and understandings.

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Identify and Categorize

The goal of the current project is to identify and categorize job requirements. It is not to produce a training curriculum. In addition, this project does not attempt to associate the skills with any particular type of school or degree. We do expect that the required skills can be grouped into specific categories as shown in Figure 3. Even though a specific certification or degree does not guarantee the acquisition of these skills, we do expect that a minimum of an Associate of Science or an Associate of Applied Science degree may be necessary.

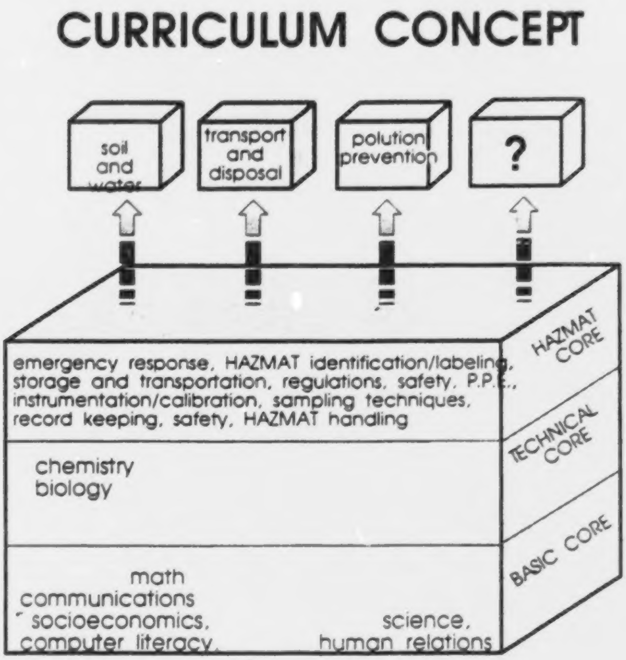
CURRICULUM CONCEPT
soil and water
transport and disposal
polution prevention
?
emergency response, HAZMAT identification/labeling, storage and transportation, regulations, safety, P.P.E., instrumentation/calibration, sampling techniques, record keeping, safety, HAZMAT handling
chemistry
biology
math
communications
socioeconomics,
computer literacy,
science,
human relations
HAZMAT CORE
TECHNICAL CORE
BASIC CORE

Figure 3

Bio-Chemical Core Skills are required by many technologies grounded in Biology or Chemistry. It is, however, necessary to analyze these very carefully because the same topic may need to be understood at different levels. For example, a chemical laboratory technician may need to understand that pH is a logarithmic expression that defines the hydrogen ion concentration. This technician may also need to understand and manipulate the relationship pH = -log H+. An HMMT technician may need to understand that pH is a measure of acidity or alkalinity with a value of 7 being neutral. However, an HMMT technician may not need to know how to manipulate the formula, only how to take soil or water samples, measure their pH with a given meter, and verify that the value is within acceptable limits.

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CONCLUSIONS

The HMMT study identifies basic skills that technicians must possess to be effective as entry-level personnel in the environmental field. These skills have been identified by a national advisory committee through a grant from the federal government, Departments of Education and Labor. The identification of these basic Skills Standard was achieved through a cooperative effort of people involved in the many facets of the environmental industry, government, and education.

Additional specialty skills may be developed or required because of an individual's interests, on-the-job training, or the unique requirements of the employer. These additional skills would represent advanced skill levels acquired after employment.

Further assessment and identification by a HMMT National Advisory Committee whose mission would be to certify that individuals have achieved the skills needed to meet minimum industry-based skill requirements may be desirable. The task of standardizing the Skills Standard by developing a conscientious and investigative certification processes to verify that they have been acquired represents additional work beyond the original scope of the project.

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"Needs Analysis and Curriculum Guide for Hazardous Materials Management Technician Training," the Texas State Technical Institute and the Center for Occupational Research and Development, Waco, TX: October 1990.

Peterson's Job Opps '94, The Environment, Peterson's Guides, Princeton, NJ: 1993.

Hazardous Materials Management Technicians

Skills Standards

Workshop for Educators

SITE VISITS

Participants will be able to choose one of the following sites for a short 1 1/2 hour visit on Monday afternoon. The visit will include a short plant tour with a plant manager who has responsibility in the environmental area and a question and answer session. Please be ready to put on appropriate safety attire furnished for the tour and to walk around on the production floor.

Allergan, Inc.
8301 Mars Dr.
Waco, TX

Irving H. Rade
Environmental Health & Safety
Administrator

Allergan is an international producer of eye care products. Major plant production is lens care solutions. The plant still has a line of contact lenses, but most of their production has been sold to another company. The plant is the manufacturer and distribution center for all Allergan products in the United States. The plant population is 310 full time employees and an average of 200 temporary employees.

Marathon Power Technologies
8301 Imperial Drive
Waco, TX

Gilbert H. Vanderwerken
Manager,
Environmental/Safety & Health

Marathon manufactures nickel cadmium batters. Major product line is industrial batteries for airplanes and very large machinery. The plant has about 300 employees.

Plantation Foods
2510 E. Lake Shore Dr.
Waco, Texas

Dr. Jim Cooper, DVM
Manager, Technical
Administration
Keith White, PhD
Corporate Ergonomist

Plantation Foods produce turkey meat products in the processed food market. The plant processes approximately 30,000 turkeys a day which go into a large number of product lines. Plantations Foods also owns farms or contracts to produce all of their birds. The plant has about 1,400 employees.

Hazardous Materials Management Technician

Job Scenario

SKILLS STANDARD—

THE-SCHOOL-TO-WORK CONNECTION

A Presentation to

The Hazardous Materials Management Technicians
Skills Standard Dissemination
Workshop for Educators

Roney Teaching Center
Waco, Texas

October 4, 1994

Dr. Walter Edling, Vice President for Service Programs
Center for Occupational Research and Development
P.O. Box 21689, Waco, Texas 76702-1689
817/772-8756 800/972-2766

Evolution of the Teaching/Learning Process

I. The Changing Mission of Education
   - A. Transmission of culture-Historical
   - B. Preparation of citizenship-Literacy (1900)
   - C. Preparation for continuing education (1945)
   - D. Education for work-education for everyone (1990)

II. Implications for the Educational Process
   - A. Challenges to and assumptions about teaching/learning
   - B. What we are discovering about teaching/learning
     1. Contextual learning
     2. Forms of intelligence
     3. Learning styles
     4. Motivation

III. Implications for Curriculum
   - A. Contextual or applied materials
   - B. Integrated curricula
   - C. Work-based learning
   - D. Worksite learning
   - E. Educational standards
     1. Academic standards
     2. Skill standards
     3. SCANS skills

The Narrowing Pyramid

For every 100 students in grade 5:

☺☺☺☺☺☺☺☺☺☺ 99 will enter grade 9

☺☺☺☺☺☺☺☺☺ 88 will enter grade 11

☺☺☺☺☺☺☺☺ 76 will graduate

☺☺☺☺☺ 47 will enter college

☺☺ only 24 will earn bachelor's degree

National Center for Education Statistics, Oct 1991

530

531

... American schooling sequesters students from the real world,

- breaks knowledge down artificially into theoretical disciplines,
- breaks disciplines down into component pieces,
- and demands that students commit fragments of knowledge to memory.
- Applications are reserved for pen-and-paper exercises at the back of the chapter.
- Interdisciplinary applications are rare, and applications in the context of working groups are even more rare.

America and the New Economy
Anthony Patrick Carnevale
ASTD/USDOL, pg. 14, 1991

F133

FIVE ASSUMPTIONS ABOUT LEARNING—ALL WRONG

1. THAT PEOPLE PREDICTABLY TRANSFER LEARNING FROM ONE SITUATION TO ANOTHER.

2. THAT LEARNERS ARE PASSIVE RECEIVERS OF WISDOM—VESSELS INTO WHICH KNOWLEDGE IS POURED.

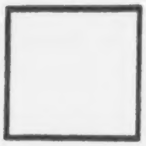
3. THAT LEARNING IS THE STRENGTHENING OF BONDS BETWEEN STIMULI AND CORRECT RESPONSES.

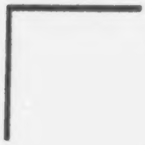
4. THAT LEARNERS ARE BLANK SLATES ON WHICH KNOWLEDGE IS INSCRIBED.

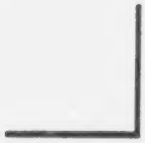
5. THAT SKILLS AND KNOWLEDGE, TO BE TRANSFERABLE TO NEW SITUATIONS, SHOULD BE ACQUIRED INDEPENDENT OF THEIR CONTEXTS OF USES.

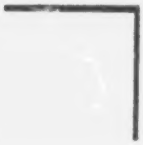
REF: Sue E. Berryman, Director, Institute on Education and the Economy, Columbia University.

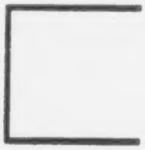
Independent of Context

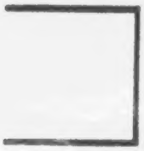
E = 

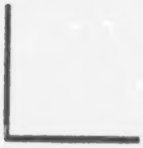
I = 

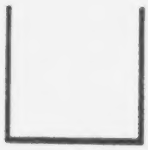
A = 

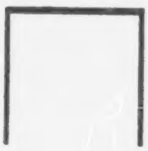
G = 

F = 

D = 

C = 

B = 

H = 

Caine and Caine. *Making Connections*-Teaching and *the Human Brain*. ASCD, Alexandria, VA: 1991

The Nature of Intelligence

Howard Gardner, Professor of Education
Harvard University

Seven Forms of Intelligence

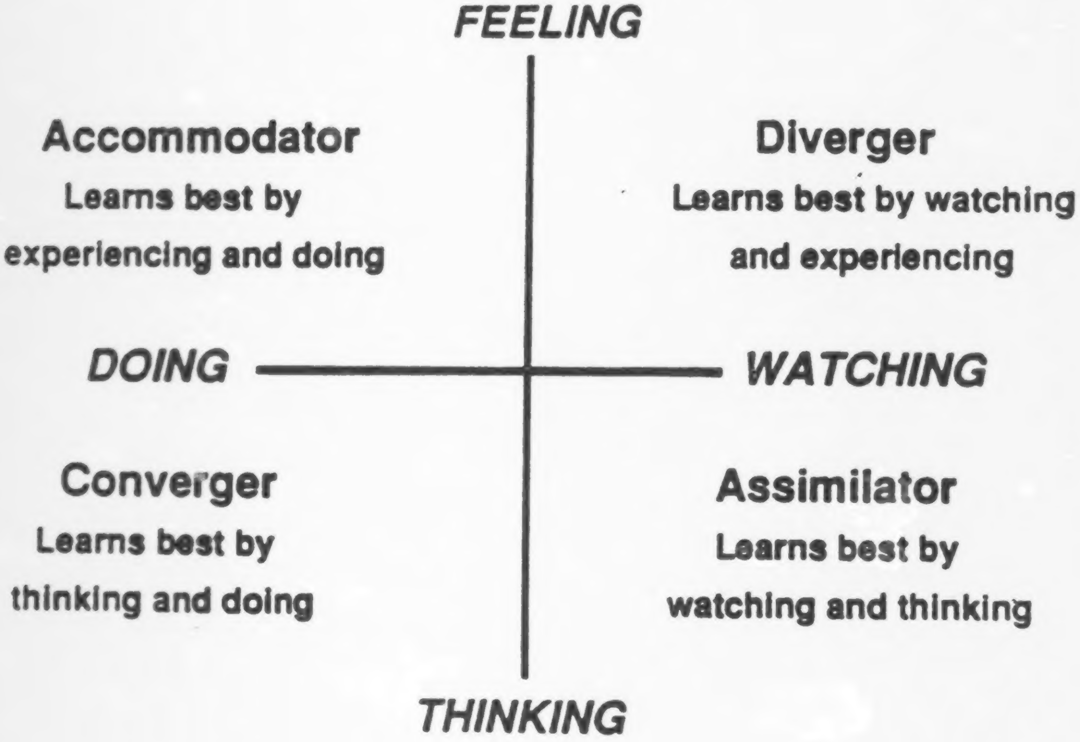
- **Linguistic**
- **Logical/Mathematical**
- **Musical**
- **Spatial**
- **Kinesthetic**
- **Interpersonal**
- **Intrapersonal**

Learning Styles

D.A. Kolb

MIT School of Management

Experiential Learners



FEELING

Accommodator
Learns best by
experiencing and doing

Diverger
Learns best by watching
and experiencing

DOING

WATCHING

Converger
Learns best by
thinking and doing

Assimilator
Learns best by
watching and thinking

THINKING

Analytical Learners

Literacy and Intrinsic Motivation

Dr. Mihaly Csikszentmihalya
Chairman, Behavioral Science
University of Chicago

- The chief impediments to literacy are not that students cannot learn; it is that they do not want to. If educators tried to stimulate the students' enjoyment of learning, we could achieve much better results.

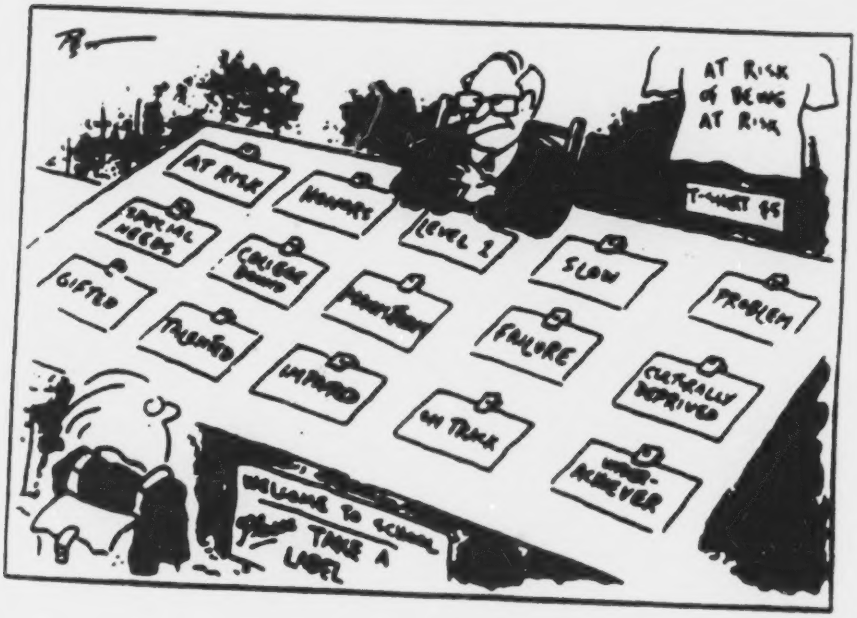
- Computers follow logical steps as long as they are plugged in; people think logically only when they feel like it.

- Literacy is the ability to code and decode information preserved in memory systems outside the brain. Illiterates are not necessarily less smart; rather, they are excluded from access to information contained in a particular set of symbols.

- What people enjoy the most in their lives is almost never something passive, like watching television or being entertained.

- Four ways to destroy spontaneous interest
    1. Impose rules, procedures, time constraints
    2. Emphasize evaluation
    3. Emphasize competition
    4. Make the individual self-conscious

(Schools follow this prescription closely)


AT RISK
OF BEING
AT RISK
T-SHIRT $5
AT RISK
HONORS
SPECIAL NEEDS
LEVEL 1
COLLEGE BOUND
GIFTED
SLOW
PROBLEM
TALENTED
FAILURE
CULTURALLY DEPRIVED
ON TRACK
UNDER-ACHIEVER
WELCOME TO SCHOOL
Please TAKE A LABEL

What Do We Know About the Learning Process?

- Most people learn best in an experiential manner involving personal participation, physical or hands-on activities and opportunities for personal discovery.
- Learning is greatly enhanced when concepts are presented in a context involving relationships that are familiar to the student.
- Most people relate better to concrete, tangible examples and experiences as opposed to abstract, conceptual models.
- Most people are extroverted learners and learn best through interpersonal communication, group learning, sharing, mutual support, team processes and positive reinforcement.
- Rote memorization is an inefficient and ineffective learning strategy.
- Transfer of learning from one situation to another is not consistently predictable and the ability to do so is a skill in itself to be learned.

Characteristics of Good Educational Practice

1. High Expectations
2. Coherence in Learning
3. Synthesizing Experiences
4. Integration of Education and Experience
5. Active Learning
6. Ongoing Practice of Learned Skills
7. Assessment of Prompt Feedback
8. Collaborative Learning
9. Considerable Time on Task
10. Respect for Diverse Talents and Ways of Knowing
11. Frequent Student—Faculty Contact
12. Emphasis on the Early Years of Study

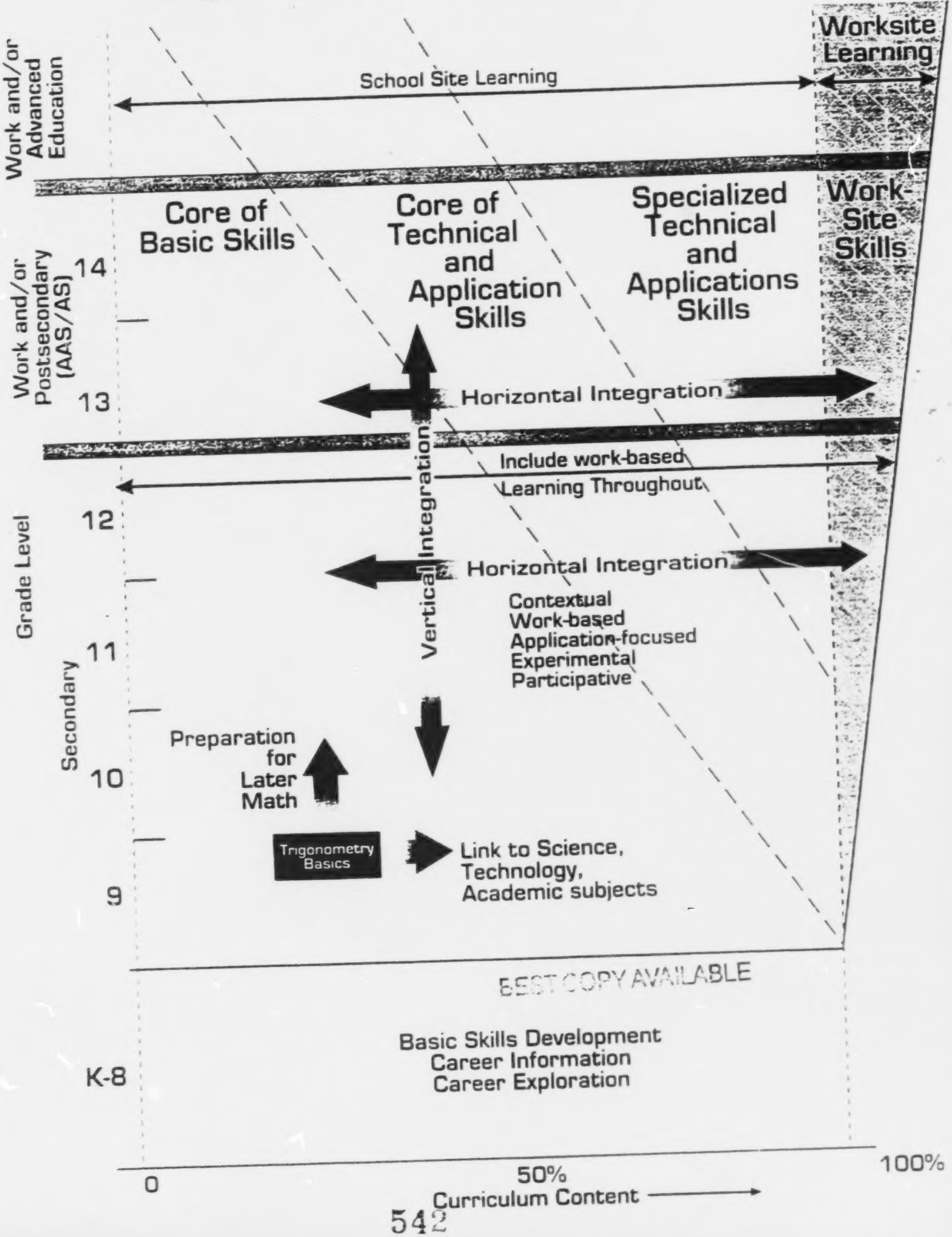
Source: O'Banion, Terry et al. *Teaching & Learning in the Community College*. Washington D.C. American Association of Community Colleges, 1994.

Tech Prep
A Broad Definition

Tech Prep is a set of principles that guide a process of curriculum reform leading to desired improvements in the educational system.

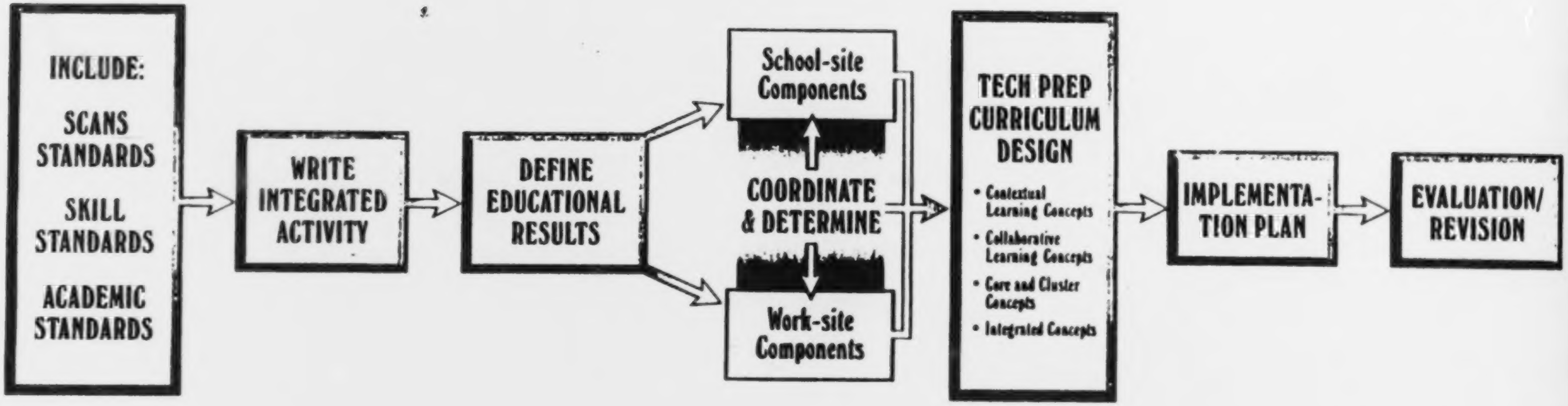
ORD

Integration in Tech Prep Curricula


Worksite Learning
School Site Learning
Work and/or Advanced Education
Core of Basic Skills
Core of Technical and Application Skills
Specialized Technical and Applications Skills
Work-Site Skills
Work and/or Postsecondary (AAS/AS)
14
13
Horizontal Integration
Include work-based Learning Throughout
12
Grade Level
Horizontal Integration
Vertical Integration
Contextual
Work-based
Application-focused
Experimental
Participative
11
Secondary
Preparation for Later Math
10
Trigonometry Basics
Link to Science, Technology, Academic subjects
9
Basic Skills Development
Career Information
Career Exploration
K-8
0
50%
100%
Curriculum Content

BEST COPY AVAILABLE

CURRICULUM DESIGN PROCESS



INCLUDE:

SCANS STANDARDS

SKILL STANDARDS

ACADEMIC STANDARDS

WRITE INTEGRATED ACTIVITY

DEFINE EDUCATIONAL RESULTS

School-site Components

COORDINATE & DETERMINE

Work-site Components

TECH PREP CURRICULUM DESIGN

- Contextual Learning Concepts
- Collaborative Learning Concepts
- Core and Cluster Concepts
- Integrated Concepts

IMPLEMENTATION PLAN

EVALUATION/ REVISION

SCAN Skills

Five Competencies

Resources: Identifies, organizes, plans, and allocates resources

A. *Time*—Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules

B. *Money*—Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives

C. *Material and Facilities*—Acquires, stores, allocates, and uses materials or space efficiently

D. *Human Resources*—Assesses skills and distributes work accordingly, evaluates performance and provides feedback

Interpersonal: Works with others

A. *Participates as Member of a Team*—contributes to group effort

B. *Teaches Others New Skills*

C. *Serves Clients/Customers*—works to satisfy customers' expectations

D. *Exercises Leadership*—communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies

E. *Negotiates*—works toward agreements involving exchange of resources, resolves divergent interests

F. *Works with Diversity*—works well with men and women from diverse backgrounds

Information: Acquires and uses information

A. *Acquires and Evaluates Information*

B. *Organizes and Maintains Information*

C. *Interprets and Communicates Information*

D. *Uses Computers to Process Information*

Systems: Understands complex inter-relationships

A. *Understands Systems*—knows how social, organizational, and technological systems work and operates effectively with them

B. *Monitors and Corrects Performance*—distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions

C. *Improves or Designs Systems*—suggests modifications to existing systems and develops new or alternative systems to improve performance

Technology: Works with a variety of technologies

A. *Selects Technology*—chooses procedures, tools or equipment including computers and related technologies

B. *Applies Technology to Task*—Understands overall intent and proper procedures for setup and operation of equipment

C. *Maintains and Troubleshoots Equipment*—Prevents, identifies, or solves problems with equipment, including computers and other technologies

What Work Requires of Schools. A SCANS Report for America 2000. A Letter to Parents, Employers and Educators. The Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor

SCAN Skills

A Three-Part Foundation

Basic Skills: Reads, writes, performs arithmetic and mathematical operations, listens and speaks

A. *Reading*—locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules

B. *Writing*—communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts

C. *Arithmetic/Mathematics*—performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques

D. *Listening*—receives, attends to, interprets, and responds to verbal messages and other cues

E. *Speaking*—organizes ideas and communicates orally

Thinking Skills: Thinks creatively, makes decisions, solves problems, visualizes, knows how to learn, and reasons

A. *Creative Thinking*—generates new ideas

B. *Decision Making*—specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative

C. *Problem Solving*—recognizes problems and devises and implements plan of action

D. *Seeing Things in the Minds' Eye*—organizes, and processes symbols, pictures, graphs, objects, and other information

E. *Knowing How to Learn*—uses efficient learning techniques to acquire and apply new knowledge and skills

F. *Reasoning*—discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem

Personal Qualities: Displays responsibility, self-esteem, sociability, self-management, and integrity and honesty

A. *Responsibility*—exerts a high level of effort and perseveres towards goal attainment

B. *Self-Esteem*—believes in own self-worth and maintains a positive view of self

C. *Sociability*—demonstrates understanding, friendliness, adaptability, empathy, and politeness in group settings

D. Self-Management—assesses self accurately, sets personal goals, monitors progress, and exhibits self-control

E. *Integrity/Honesty*—chooses ethical courses of action

What Work Requires of Schools. A SCANS Report for America 2000. A Letter to Parents, Employers and Educators. The Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor

Hazardous Materials Management Technician Skills Standard

Revisions to Initial Working Draft

(Not for Dissemination)

October 6, 1994

JOB FUNCTION: (A)
Assist in the evaluation of hazardous materials and hazardous waste sample data.

Supporting knowledge/skills:

- Perform mathematical calculations following existing formulae and reference materials
- Prepare maps, plans, graphs, charts, curves, and spreadsheets from plotted and tabulated data
- Collect, tabulate, and assist in the evaluation of data using appropriate techniques and technology such as:
  - computers
  - calculators
  - spreadsheets
  - graphics
  - data bases
- Check laboratory and/or field sample analysis by comparison to regulatory limits
- Document and evaluate meter and gauge reading trends and implement appropriate actions
- Read and interpret maps and blueprints

JOB FUNCTION: (B)

Safely handle hazardous materials and hazardous wastes.

Supporting knowledge/skills:

- Use chemical reference materials to obtain information on proper chemical handling
- Communicate with suppliers to obtain product information
- Recognize, apply, and respond appropriately to chemical hazard information
- Direct personnel in the proper handling and control of hazardous materials and hazardous wastes
- Identify and implement safe ergonomic controls and procedures
- Recognize, apply, and respond appropriately to chemical hazard information
- Demonstrate safe handling procedures for chemical containers such as:
  - Drums
  - Bulk containers
  - Portable and stationary tanks
- Identify and respond to emergencies, alarms, and abnormal situations in accordance with written procedures
- Identify and implement safe chemical handling procedures such as:
  - Bonding
  - Grounding
  - Vapor control
  - Ventilation
  - Storage
  - Fire control
- Provide on-the-job training as required

JOB FUNCTION: (C)

Respond to hazardous materials and waste emergency situation in accordance with regulatory requirements.

Supporting knowledge/skills:

- Participate as a member of an emergency response team
- Ensure that adequate spill control and equipment supplies are available at all times
- Implement necessary components of an emergency response plan
- Participate in the development and revision of emergency response programs
- Demonstrate competency and maintain certification in first aid and CPR
- Follow guidelines for controlling leaks from containers
- Apply environmental considerations to emergency situations

JOB FUNCTION: (D)

Operate equipment related to hazardous materials and hazardous waste operations.

Supporting knowledge/skills:

- Identify and describe the safe and proper use of equipment such as:
    - Drum crushers
    - Heavy equipment
    - Hand tools
    - Power tools
    - Motorized lifting devices
    - Pumps, valves, and meters
    - Monitoring and sampling equipment and instrumentation
- Demonstrate safe and proper practices in the use of equipment such as:
    - Drum crushers
    - Heavy equipment
    - Hand tools
    - Power tools
    - Motorized lifting devices
    - Pumps, valves, and meters
    - Monitoring and sampling equipment and instrumentation
- Identify, describe, and use appropriate equipment decontamination procedures
- Identify, describe, and use appropriate operations and maintenance procedures, plans, and manuals
- Identify, describe, and use appropriate health and safety equipment such as:
    - Fire extinguishers, vehicles, and equipment
    - Eye wash and safety showers
    - First aid
    - Communication systems

JOB FUNCTION: (E)

Identify and label hazardous materials and hazardous waste in accordance with regulatory requirements.

Supporting knowledge/skills:

- Identify, characterize, and label hazardous materials by chemical and physical properties, such as:
  - toxicity
  - flammability
  - corrosivity
  - reactivity
  - specific gravity
  - density
  - viscosity
  - color
- Identify and characterize hazardous wastes according to regulatory standards such as:
  - ignitability
  - corrosivity
  - reactivity
  - TCLP toxicity
  - acute toxicity
- Provide proper labeling instructions for hazardous wastes
- Use chemical reference materials to obtain identification and labeling information
- Check for correct labels and MSDS when shipment is received
- Label containers of repackaged materials with appropriate warnings and expiration information
- Direct personnel in the proper identification and labeling of hazardous materials
- Communicate with suppliers to obtain identification and labeling information

JOB FUNCTION: (F)
Calibrate, operate and maintain instrumentation.

Supporting knowledge/skills:

- Evaluate and record meter and gauge readings
- Perform routine maintenance of equipment and instrumentation
- Operate gages, meters, monitoring and sampling instrumentation
- Calibrate and operate field and laboratory instrumentation such as:
  - Air monitoring instrumentation
  - Groundwater monitoring instrumentation
  - Surface water monitoring instrumentation
  - Soil monitoring instrumentation
  - Solid waste monitoring instrumentation
- Identify the need for and comply with factory calibration

JOB FUNCTION: (G)

Compile, record, and maintain required documents for hazardous materials and hazardous waste management activities.

Supporting knowledge/skills:

- Compile and maintain a hazardous materials inventory
- Compile and maintain documentation of hazardous materials, such as:
  - field notebooks
  - laboratory data
  - vendor invoices
  - purchase orders
  - Material Safety Data Sheets (MSDS)
  - manifests
  - shipping documents
  - exception reports
  - chain of custody
  - equipment calibration and maintenance
  - incident documentation
- Compile and maintain records to prepare compliance reports
- Ensure current Material Safety Data Sheets are available in the workplace
- Operate and maintain auditable recordkeeping systems in accordance with regulatory requirements
- Conduct and maintain a hazardous waste inventory
- Communicate with suppliers to obtain product information
- Identify and maintain an inventory of empty and full containers
- Compile and maintain personal health and safety records

JOB FUNCTION: (H) *Implement procedures to comply with appropriate regulations.*

Supporting knowledge/skills:

- Read and apply regulatory standards to assure compliance in operations
- Obtain hazardous materials and hazardous waste permits and/or approvals
- Describe the regulatory process from the introduction of a bill to the promulgation of a regulation
- Identify and describe the penalties for noncompliance
- Differentiate between federal, state and local hazardous materials and hazardous waste regulations and identify appropriate regulatory agencies
- Identify the regulatory changes and the impact they have on the operation
- Comply with federal, state, and local hazardous materials and hazardous waste regulations
- Conduct audits and inspections to ensure waste management activities are in compliance with local, state and federal regulatory regulations
- Follow written company standard operating procedures
- Comply with federal, state, and local health and safety regulations
- Identify sources of current or timely regulatory information

JOB FUNCTION: (I)
Implement applicable safety regulations and procedures.

Supporting knowledge/skills:

- Demonstrate safe health and work habits
- Identify and respond appropriately to unsafe work conditions and situations
- Read and implement regulatory standards and guidance relative to worker safety and health such as:
  - Lockout/Tagout
  - Confined Space
  - Hearing Conservation
  - Blood-borne pathogens
  - Fire safety
  - Emergency egress
- Identify and describe unsafe workplace and job conditions and implement corrective actions

JOB FUNCTION: (J)

Select and use appropriate personal protective equipment and respiratory protection.

Supporting knowledge/skills:

- Utilize and interpret chemical reference materials in the selection of appropriate personal protective equipment and respirators
- Communicate with suppliers and manufacturers to obtain product information
- Identify, describe, and use personal protective equipment that is appropriate to the work conditions
- Identify and describe the elements of respiratory and personal protective equipment plans
- Identify, describe, and use respiratory protection that is appropriate to the work conditions
- Identify, describe, and use appropriate decontamination and disposal procedures for respirators and personal protective equipment
- Identify and describe hazards associated with the use and limitations of personal protective equipment and respiratory protection
- Maintain and inspect Personal Protective Equipment and respiratory protection according to regulations

JOB FUNCTION: (K)

Collect, prepare, document, and ship samples for analysis.

Supporting knowledge/skills:

- Perform and document sampling for waste characterization purposes
- Perform field tests according to instructions and procedures
- Calibrate and operate as required field test equipment such as:
  - – Hand augers
  - – Split spoons
  - – Bailers
  - – Pumps
  - – Organic vapor analyzers
  - – Air monitoring equipment
- In accordance with instructions and/or procedure, collect samples such as:
  - – soil
  - – surface water
  - – groundwater
  - – air
  - – solid wastes
  - – bulk materials
- Identify and control for potential sample interferences
- Decontaminate equipment in accordance with quality control/quality assurance procedures
- Identify and describe the appropriate use, limitations, and applications for sampling equipment such as:
  - – Organic Vapor Analyzer
  - – Combustible Gas Indicator
  - – Colorimetric Indicators
- Perform personal exposure monitoring in accordance with appropriate standards such as:
  - – Threshold Limit Value-Biological Exposure Indices
  - – Radiation dosimetry
  - – Oxygen monitoring
  - – Noise monitors
  - – Temperature extremes
- Prepare and ship samples to laboratory

JOB FUNCTION: (L)
Transport and store hazardous materials and hazardous waste in accordance with applicable regulations.

Supporting knowledge/skills:

- Monitor documentation related to the shipment of hazardous materials and hazardous wastes
- Identify incompatible combinations of chemicals that could result in potentially dangerous situations
- Label containers with appropriate identification and expiration information
- Safely package, load, document, and ship hazardous materials and hazardous waste in compliance with appropriate regulations
- Inspect hazardous waste storage areas for compliance with appropriate rules and regulations
- Properly segregate and store incompatible hazardous materials and hazardous wastes
- Read and interpret flow diagrams, schematics, and blueprints

JOB FUNCTION: (M)

Operate hazardous materials and hazardous waste treatment and disposal systems.

Supporting Knowledge/Skills:

- Record and maintain documentation of operations activities
- Follow appropriate plans such as:
  - Health and Safety Plan
  - Initial Sampling Plan
  - Assessment Plan
  - Remediation Plan
  - Risk Assessment
  - Site Closure Plan
  - Waste Minimization Plan
- Assist and contribute to the development and revision of plans and reports such as:
  - Health and Safety Plan
  - Assessment Plan
  - Remediation Plan
  - Risk Assessment
  - Site Closure Plan
- Prepare and maintain hazardous waste manifests and associated documents for inspection
- Select appropriate drums and containers
- Implement good housekeeping practices in the workplace
- Check and document activities of waste treatment and disposal contractors
- Working individually or with others, develop improvements in the reduction, reuse, recycling, or disposal of wastestreams
- Coordinate collection and disposal of empty containers
- Prepare accumulated hazardous waste for disposal
- Identify and describe treatment, removal and disposal systems such as:
  - volatile organic compounds
  - incineration
  - bio-remediation
  - vitrification
  - deep-well injection
  - chemical and physical treatment
- Identify and describe hazards associated with abatement such as:
  - asbestos
  - lead
  - fiberglass
- Identify and describe hazards associated with treatment, removal, and disposal systems and operations
- Provide on-the-job training as required

The NIST Manufacturing Extension Partnership - Environmental Strategies

presented to the
HMMT Skill Standards Development Project Meeting
10/4/94
by Chuck Ernst, NCATC/NIST Liaison - 301-975-5034

What is the Manufacturing Extension Partnership (MEP)?

- The MEP is an external program of the National Institute of Standards and Technology (NIST) designed to build a nationwide system of technology services for helping small and medium sized manufacturers (SMEs) become more competitive.

Why is it important to help SMEs?

- Manufacturing productivity is correlated with the national standard of living; SMEs account for nearly half of US industrial output.
- Manufacturing jobs have a higher multiplier than other jobs.
- There are 370,000 SMEs (firms with less than 500 employees make up 98% of all manufacturing establishments).
- SMEs contribute more than half the value-added in manufacturing in the nation.
- SMEs employ 65% of all manufacturing employees (over 8 million jobs) and account for 75% of the new jobs in manufacturing.
- SMEs supply many of the components used by larger firms.

What is MEP's Environmental Objective?

- To enable smaller manufacturers to implement technologies and techniques which allow them to be environmentally competitive.

What are the environmental challenges facing small manufacturers?

- SMEs lack awareness of commercial technologies or techniques which could enable them to be more environmentally competitive.
- New environmental requirements are often implemented before technologies and techniques for compliance are commercially available.
- SMEs often are unaware of the environmental requirements they must meet.
- Environmental regulations and enforcement methodologies sometimes prevent the use of technologies or techniques which would enable an SME to be environmentally sound in a competitive way.
- SMEs often lack available capital to invest in technologies or techniques which would allow them to be environmentally competitive.
- SMEs are sometimes uninterested in addressing environmental issues because they believe it will yield little benefit for their companies.

What will MEP try to do?

- Assist SMEs to
  - Implement appropriate advanced technology and techniques
  - Adopt best manufacturing and management practices
  - Adopt modern workforce training and organization approaches
- Provide a nationwide system for manufacturing modernization, building on existing organizations (like community colleges and vocational-technical centers), resources, and experience

How will MEP seek to meet the goals?

- Establish 100 Manufacturing Extension Centers (MECs) by 1997 (35 have cooperative agreements now; more than 100 community colleges and vocational-technical centers are involved in these plans)
  - Manufacturing Technology Centers (MTCs; 16 exist now, of which 9 are new)
  - Manufacturing Outreach Centers (MOCs; 19 exist now, but all are new)
- State Technology Extension Program (STEP)
- LINKS

What are MEP's environmental strategies?

- Increase access to and use of high quality environmental technical assistance
- Create access to seamless, coordinated environmental technical assistance
- Create, integrate and increase access to intellectual and informational tools
- Catalyze initiation of needed R&D
- Catalyze changes in regulatory enforcement
- Create mechanisms for reducing financial barriers

What are MEP's resources?

- $90.6M in FY95 from the Department of Commerce (out of a total NIST budget of $855M that also includes $431M for the Advanced Technology Program [ATP])
- $64.4M in FY95 from the Department of Defense (Technology Reinvestment Project [TRP] programs administered by MEP)

What do Manufacturing Extension Centers do?

- Assessment of company needs
- Assistance to companies undertaking fundamental reshaping
- Providing technical expertise through field engineers and consultants
- Integration of service delivery
- Technical assistance projects
- Demonstration of hardware and software
- Assistance in selection of hardware, software, and training
- Providing links to technology developers (federal labs, universities, etc.)

MTC technical assistance projects (most recent quarter):

- quality/inspection - 139
- business systems/management - 84
- CAD/CAM/CAE - 71
- market development - 62
- plant layout/manufacturing cells - 57
- material engineering - 42
- process improvement - 41
- product development - 28
- automation/robotics - 28
- EDI/communications/LAN - 27
- environmental - 24
- other - 16
- control systems/integration - 13

MECs need linkages to other agencies in related services:

- Workforce training and workforce organization (linkages to community colleges and vocational-technical centers needed)
- Human resources issues
- Business system development
- Marketing
- Financing

Manufacturing Extension Center characteristics and outlook:

- MTCs (expected to grow to 30 over 4 years)
  - serve a region with 6,000 to 8,000 manufacturers
  - have a total budget of $6M (1/2 - 1/3 federal)
  - have substantial technical/management resources
- MOCs (expected to grow to 70 over 4 years)
  - serve a region with 600-800 manufacturers
  - have a total budget of $1M (1/2 - 1/3 federal)
- MECs have strong local ties and links to state infrastructure
- MECs have user fees that vary by center and service delivered

MEP strategies to increase access to environmental technical assistance:

- Integrate environmental services into manufacturing extension
- Develop environmentally-focused evaluation methodologies for extension activities
- Increase awareness of manufacturers and organizations which influence manufacturers
- Develop and utilize existing environmental training for field engineers

MEP strategies to create access to environmental technical assistance:

- Increase NIST/EPA coordination (MEP now has a visiting staff member from EPA)
- Increase NIST/DOE coordination (MEP now has visiting staff members from the Oak Ridge National Laboratory and the Savannah River Facility)
- Increase NIST/MEP and state pollution prevention program coordination

MEP strategies to create intellectual and informational tools:

- Enhance electronic access to information on environmental technologies and techniques
- Enhance electronic access to information on environmental rules and regulations
- Create environmental benchmarks
- Pilot an industry-focused environmental resource center
- Develop other tools

MEP strategies to catalyze initiation of needed R&D:

- Assist interested organizations in setting environmentally focused R&D priorities
- Increase the rate of commercialization of new and improved environmental technologies

MEP strategies to catalyze changes in regulatory environment:

- Foster closer working relationships among technical assistance providers and state environmental regulatory agencies
- Use technical assistance providers for input in the EPA Source Reduction Review Project (SRRP) process

MEP strategies for reducing financial barriers:

- Enhance access to capital with information on financial options
- Build financial core competence to increase the likelihood of loan approval

Community college roles in MECs:

- Host MTCs (Cuyahoga CC, DesMoines Area CC)
- Have service agreements with MTCs (Lorain County CC, Grand Rapids JC, Midlands CC)
- Host field offices for MTCs (Iowa CCs)
- Host MOCs (Patrick Henry CC, Maricopa CC District)
- Provide outreach offices for MOCs (Northwest Wisconsin technical colleges)

STEP helps state technology extension programs by:

- funding and providing technical support for planning
- providing support for extension in states with sparse manufacturing
- building links among states and between states and federal technology sources

LINKS supports the MECs by:

- providing a national information infrastructure for communication and access to information (TECnet)
- evaluation of extension activities
- training of field agents
- developing tools
- providing linkages with other national organizations

Community College Roles in STEP and LINKS:

- Partners in STEP grants (Bevill Center at Gadsden State CC, New Hampshire Technical Colleges)
- TRP award to the National Coalition of Advanced Technology Centers (NCATC) will include:
  - establishing electronic communication among the ATCs
  - providing the ATCs all of the sources and expertise available to the MECs through TECnet tools and their upgrades

MEP Points of Contact:

- Quality, Evaluation, and Training - Ruth Haines (301)975-6454, ruth@micf.nist.gov
- Outreach/Linkages - Gale Morse (301)975-4520, gale@micf.nist.gov
- LINKS - Tom Walker (301)975-4176
- NCATC/NIST Liaison - Chuck Ernst (301)975-5034, cernst@mep.nist.gov
- General Information - (301)975-5020

PARTNERSHIP FOR
ENVIRONMENTAL TECHNOLOGY EDUCATION

6601 Owens Drive, Suite 235
Pleasanton, California 94588
(510) 225-0669 FAX: (510) 225-0679

For your information:

PROGRAM SUMMARY

July 30, 1994

A Community College Initiative
Equal Opportunity Employers

ABSTRACT

PARTNERSHIP FOR ENVIRONMENTAL TECHNOLOGY EDUCATION (PETE)

The need for broad cooperative effort directed toward the enhancement of science, mathematics and technical education, including environmental science and technology, has been recognized as a national priority by government, industry, and the academic community alike. In an effort to address this need, the Partnership for Environmental Technology Education (PETE) has been established as a national non-profit organization designed to link the technical resources of the DOE, DoD, EPA, and NASA Laboratories, federal and state agencies, private industry and professional societies with participating community colleges. PETE's programmatic focus is to assist in the development and presentation of curricula for training environmental technicians, to encourage more transfer students to pursue studies in environmental science, engineering and management at four-year institutions and to conduct special projects designed to enhance the participation of underrepresented minorities and women in environmental fields, promote technology transfer, etc. The PETE network, piloted originally in the five western states of Arizona, California, Hawaii, Nevada and Utah, now consists of six regional public/private partnerships serving all fifty states, Puerto Rico and the U. S. territories.

INTRODUCTION

The need for broad cooperative effort directed toward the enhancement of science, mathematics and technology education in the United States has been recognized as a national priority by government, industry and the academic community alike. Within the context of this broad need, the U. S. Department of Energy (DOE), the U. S. Environmental Protection Agency (EPA), and the Department of Defense (DoD) have defined "needs driven" or specific interests which require increasing the numbers of qualified graduates in areas of environmental science, engineering and management, including technicians, and fostering improved public literacy in environmental science and waste management. Carefully targeted education intervention programs are required if these important goals are to be realized.

There are approximately 1,200 community, technical and junior colleges in the U. S. with a 1992 student population of 6.0M. This does not include another 6.0M non-credit enrolled students attending these two-year institutions. On the basis of sheer numbers alone, these institutions represent a significant, nationwide resource that should play a key role in the conduct of a successful environmental protection/restoration and waste management education and training program.

Community colleges have been in the process of a major transition during the 1980s. They have moved toward a much stronger role in vocational education and in supporting U. S. industry. Despite this major shift toward vocational education, however, the nation's community colleges still represent a key transition point for millions of students (particularly minority students) between high school and the four-year institutions. Operating on a philosophy of higher education opportunity for all, with minimal entrance requirements and low cost, the community colleges afford the average high school student the opportunity to start college when they may not have qualified to enter a four-year institution, or may still be trying to decide the appropriate direction of their college careers. The community colleges also increasingly represent the easy access, low cost alternative for people already in the work force to return for continuing vocational training or retraining for new career directions.

For these reasons, most of the minority or other disadvantaged students presently pursuing post-secondary education in the U. S. today are attending a community college. An environmental education intervention program which recognizes current problems in the nation's education system and is geared to the realities of changing demographics must focus adequate programmatic attention on this pivotal segment of the education pipeline.

PETE'S MISSION

Provide leadership in environmental education and training through community and technical college partnerships with industry and government.

APPROACH

PETE has been established as a national non-profit organization consisting of six regional public/private partnerships. These regional partnerships are designed to link the technical resources of federal laboratories, state and federal agencies and the private sector with a network of community colleges to provide direct technical assistance for:

- Development and presentation of broad environmental technician curricula at the two-year degree/certificate level,

- Development of clearly articulated education pipelines in environmental studies targeting the attraction of high school students and preparation of transfer students to four-year institutions,
- Conduct of special projects in support of national environmental education, training, job creation, and public scientific literacy goals.

PETE is designed to provide a permanent organizational framework, organized nationally, but implemented regionally, within which employers, federal laboratories, government and professional organizations can contribute to the development of strong, responsive community college environmental education and training networks. Once in place, the partners will draw upon this network for new employees, training services, and the support of special activities.

GOALS

1) Create permanent regional public-private partnerships to support a national network of community colleges delivering quality environmental education and training.
2) Develop and support quality community and technical college programs targeting environmental technicians.
3) Establish quality articulated programs creating an environmental education ladder from high school through the post graduate level.
4) Meet the environmental technician workforce education, training and retraining needs of the nation.
5) Stimulate economic development and international competitiveness through facilitating environmental technology transfer among U. S. business, industry and government.
6) Contribute to the improvement of global environmental quality through international programs and partnerships in environmental education and training.

NCRVE NATIONAL LABOR MARKET STUDY

The National Center for Research in Vocational Education, a part of the U. C. Berkeley Graduate School of Education, is a study center funded by the U. S. Department of Education. The Center has completed a two-year assessment of the projected national labor market demand and skills requirements for Environmental-Hazardous Materials Technicians and Related Workers on a matching funds basis as a part of its Department of Education-supported program. This study concluded, among other things, that there was a significant growing demand for properly prepared Associate of Science degree level technicians and "highly recommended that the community college system rigorously pursue advancement of such courses." The study was co-sponsored by DOE (through PETE) and the US Department of Education.

PILOT PROGRAM

PETE was initiated in FY 1991 by the U. S. Department of Energy (DOE) on a pilot basis in the five western states of Arizona, California, Hawaii, Nevada and Utah. The purpose was to demonstrate the concept of establishing a public/private partnership on a regional scale that implemented the approach described above. The primary focus of effort during this pilot period was the establishment of the participating community college network, the supporting partners and the organizational framework necessary to ensure effective coordination and maximum cooperation. In cooperation with the State of California, PETE has assisted in establishing a network of 40 community colleges in the five states constituting Western PETE. These colleges are now offering or are in the process of developing Associate of Science degree/certificate programs in environmental technology. A program for faculty development has been implemented including regional conferences (seven to date) and summer internships in the Laboratories, the offices of state regulatory agencies, DoD facilities, and private industry locations. A Student Work Experience Program is being planned to begin in the summer of 1995. Western PETE has also initiated a program focused on the development of formal articulation agreements between the community colleges, the high schools that feed those colleges, and the universities (e.g. 2+2+2/Tech Prep).

The Western PETE program has been developed through the collaboration of several key regional players.

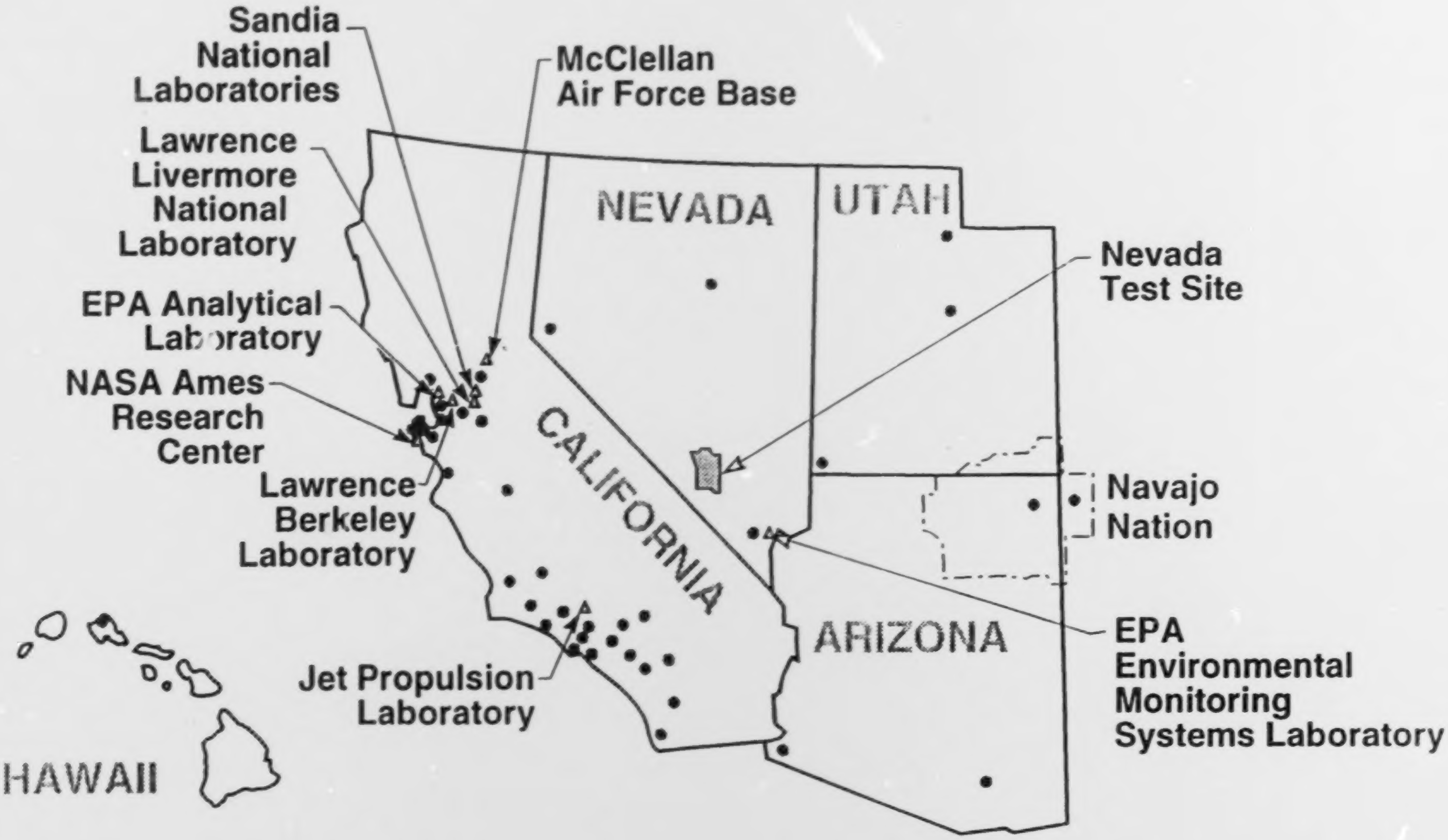
- Arizona, California, Hawaii, Nevada, Utah Community Colleges
- Ames Research Center (NASA)
- California Environmental Protection Agency
- Arizona Department of Environmental Quality
- Environmental Monitoring Systems Laboratory (EPA)
- Industry Education Council of California
- Jet Propulsion Laboratory (NASA)
- Lawrence Berkeley Laboratory (DOE)
- Lawrence Livermore National Laboratory (DOE)
- McClellan Air Force Base (DoD)
- National Center for Research in Vocational Education
- National Environmental Training Association
- The Navajo Nation and Navajo Community College
- Nevada Test Site (DOE)
- Region IX Analytical Laboratory (EPA)
- Sandia National Laboratories, California (DOE)
- Western Division Naval Facilities Engineering Command (DoD)

Also participating in the program is the American Association of Community Colleges, the Department of Energy Oakland and Nevada Operations Offices, and the EPA Region IX Office. The California EPA participation includes the Air Resources Board and the Department of Toxic Substances Control. Representatives of the Environmental Protection Office in each of the other four PETE states have also been invited to participate. Representatives of these organizations operated as a Steering Committee until late 1993 when the group was constituted as a Board of Directors following non-profit incorporation in the State of Arizona.

NATIONAL PETE

Based on the successful Western PETE model, a total of six regional partnerships have now been established serving all fifty states, Puerto Rico and the U. S. territories. PETE's national objectives are to establish the six regional partnerships with consistent organizational structure and a common commitment to the six goals listed above. National initiatives focused on such areas as enhancing the participation of underrepresented minorities and women, enhancing the science and environmental education capabilities of Tribal Colleges, worker retraining associated with defense conversion, and innovative approaches to environmental technology transfer will be delivered in a consistent fashion through the six regions. Each regional organization is intended to organize and function, however, as a semi-independent partnership also focused on uniquely regional problems and developing local resources. It is estimated that the national PETE community college network will eventually represent 300-500 colleges delivering a variety of environmental programs.

PETE Colleges - Fy 1993


Sandia National Laboratories
McClellan Air Force Base
Lawrence Livermore National Laboratory
EPA Analytical Laboratory
NASA Ames Research Center
Lawrence Berkeley Laboratory
Jet Propulsion Laboratory
NEVADA
UTAH
CALIFORNIA
ARIZONA
HAWAII
Nevada Test Site
Navajo Nation
EPA Environmental Monitoring Systems Laboratory

579

580

40 Participating Community Colleges

ROLE OF PRIVATE INDUSTRY AND PROFESSIONAL SOCIETIES

Private industry and professional societies will play a vital role in the development and conduct of the program. This includes advising on skills requirements and on curricula development and presentation. Along with government, private industry will be a primary beneficiary of the significantly increased number of technician graduates which will result from this initiative. We will seek substantial private sector participation and/or in-kind support for the program. This could primarily involve assistance with equipment needs, co-sponsorship of semi-annual regional conferences, and summer internship opportunities for instructors and students. The Industry Education Council of California, a statewide consortium of government, industry and academia, is a full partner in Western PETE, bringing direct access to many of the state's major corporations. This model will also be followed throughout the six PETE regions.

PETE and the Air and Waste Management Association have signed a formal Memorandum of Understanding to collaborate on environmental education programs of mutual interest. The American Chemical Society is also advising on the development of the regional and national PETE initiative.

CURRICULA AND TEACHING AIDS DEVELOPMENT

One of the primary issues raised since the formation of PETE has been the general lack of appropriate texts and teaching aids to support environmental-hazardous materials technician curricula at the community college level. In response to this need, a National Instructional Materials Working Group was established, which included representatives from eight leading colleges outside the PETE region, to develop teaching materials for core curriculum modules in this field. Eight core module outlines have been developed. PETE has entered into a Cooperative Agreement with INTELECOM, a non-profit community college telecommunications consortium, to manage the project and develop accompanying video sets. The firm of Van Nostrand Reinhold (New York) has been selected as lead publisher. This project entitled *"Preserving the Legacy"* is expected to require up to five years for completion.

NATIONAL SCIENCE FOUNDATION SUPPORT

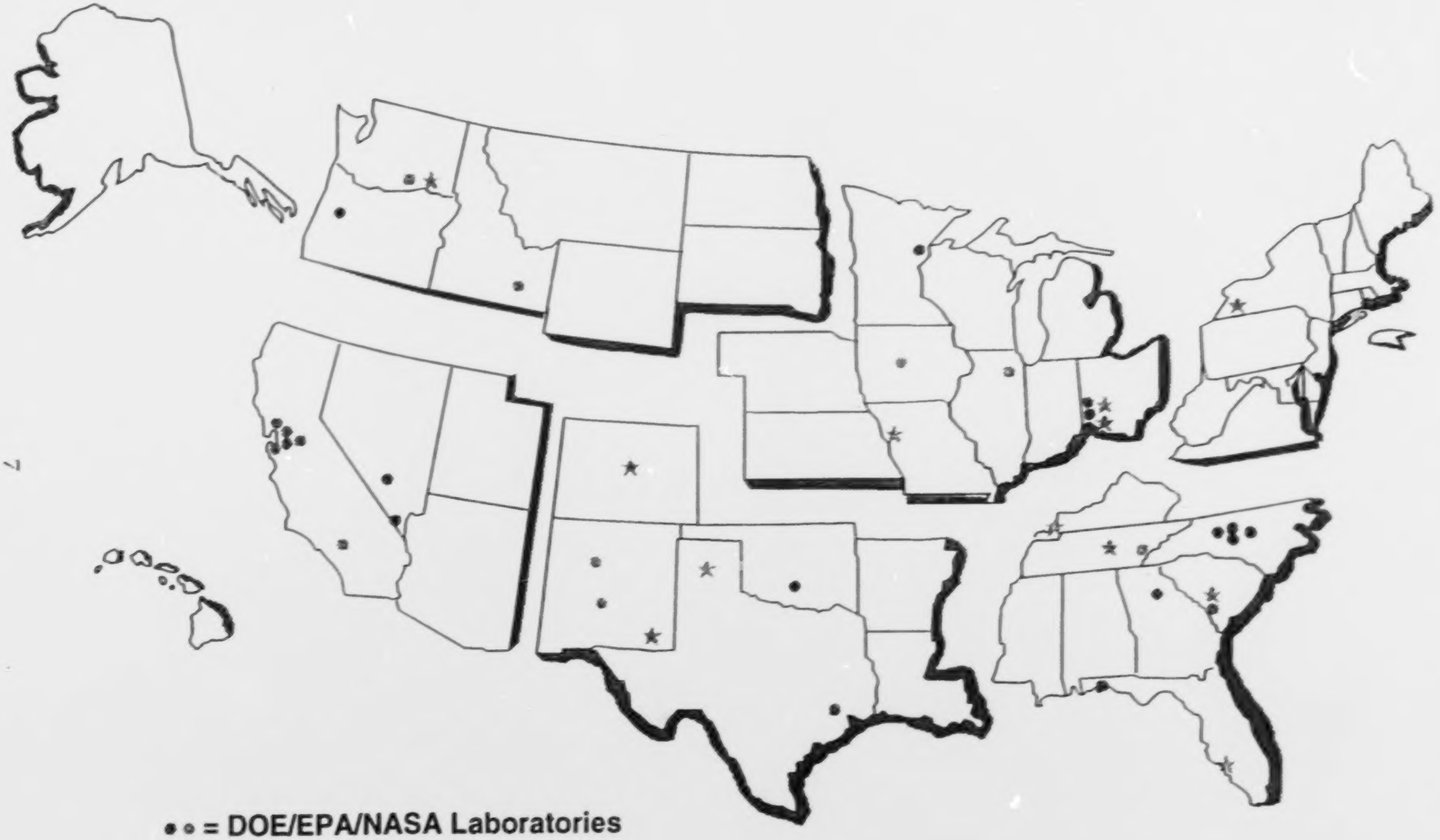
In July 1994 NSF accepted two proposals which will assist in supporting PETE's long-term objectives. PETE will partner with the Hazardous Materials Training and Research Institute (HMTRI) and the University of Northern Iowa's Center for Environmental and Energy Education to establish a national Advanced Technology Environmental Education Center (ATEEC). The vision is to create a world class network of community college environmental programs linked with high schools that inform and prepare students for entry into these two-year programs. The ATEEC has established three broad goals: 1) Develop nationally validated curriculum models and advanced instructional materials; 2) Establish comprehensive programs of professional development; and 3) Build a clearinghouse to serve as a national center for environmental education. NSF will fund ATEEC at a level of $1.0M per year for five years.

NSF will also fund the initiation of the *"Preserving the Legacy"* instructional materials development project at a level of $0.5M per year for three years. Other federal and private sponsors will be sought to support the balance of the project.

INTERNATIONAL PROGRAMS

PETE has been receiving growing international attention and has begun some collaboration in other countries. The Partnership is assisting in the establishment of an environmental training network in Mexico, the International Institute for Environmental Technology and Management (IIETM), designed to assist that country in complying with the environmental provisions of the

Six Regional PETE Programs



● ○ = DOE/EPA/NASA Laboratories

★ = DOE Production Complex

North American Free Trade Agreement (NAFTA). This developing partnership with Mexico will focus on linking U. S. community colleges with Mexican institutions to deliver Train-The-Trainer programs for worker preparation in areas such as hazardous waste management, water-waste water management, site remediation, etc. PETE will also assist in linking U. S. and Mexican university programs in environmental areas.

ORGANIZATION AND MANAGEMENT

The national PETE program has been incorporated as a non-profit educational organization, and a national office with a small program development staff established in Northern California. A Board of Directors has been named consisting of representatives of each of the six regional partnerships and selected organizations, and an Executive Director appointed. A Presidents Council, consisting of designated community college Presidents from each of the six regions will serve in a key advisory capacity to the Board of Directors. A national Advisory Council will also be established which will include representatives of participating federal agencies, private industry and professional societies. Each of the six regional partnerships is functioning under a Steering Committee or Board of Directors with a designated non-profit organization serving as fiscal agent. Program implementation will be the responsibility of six regional Directors and the national PETE Executive Director.

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Northeast PETE

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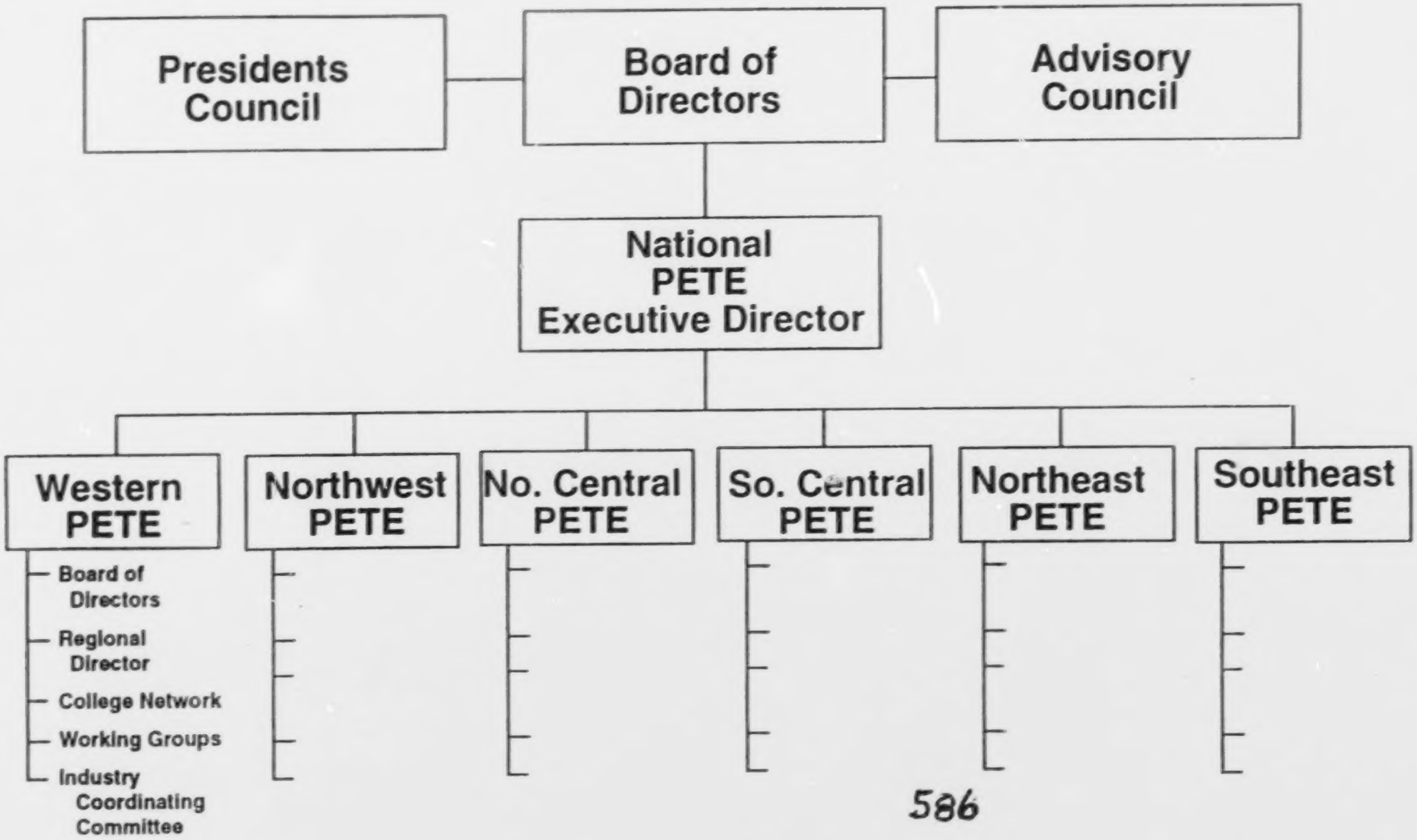
NATIONAL PETE ORGANIZATION



Presidents Council

Board of Directors

Advisory Council

National PETE Executive Director

Western PETE

- Board of Directors
- Regional Director
- College Network
- Working Groups
- Industry Coordinating Committee

Northwest PETE

No. Central PETE

So. Central PETE

Northeast PETE

Southeast PETE

COMMUNITY COLLEGES
★
INDUSTRY
★
GOVERNMENT
★

NATIONAL PETE UPDATE

Paul R. Dickinson
Executive Director

July 29, 1994
Phoenix, Arizona

A Community College Initiative

BEST COPY AVAILABLE

PRESERVING THE LEGACY

A Comprehensive Curriculum and Materials Development Project in Support of Advanced Environmental Technology Education

INTRODUCTION

INTELECOM Intelligent Telecommunications (INTELECOM), in cooperation with the Partnership for Environmental Technology Education (PETE), is launching a multi-year development project that will result in the creation of an integrated set of video modules, textbooks, laboratory materials, and faculty guides for training environmental technicians. These exemplary instructional materials, collectively called *PRESERVING THE LEGACY*, will be integral to environmental technology programs throughout the country. Their development, evaluation, and dissemination will be closely linked to the Advanced Technology Environmental Education Center proposed by PETE and the Hazardous Materials Training & Research Institute (HMTRI).

There is a rapidly growing need in this country for workers with appropriate science-based skills in hazardous materials management, environmentally-conscious manufacturing, environmental remediation and monitoring, and pollution prevention. As this need becomes more acute, so, too, does the need for the *PRESERVING THE LEGACY* materials. The success or failure of many environmental policies will be determined less by the excellence of our research base than by the proficiency of field workers and technicians responsible for implementing them. Both the environmental and economic health of this country and other nations will be greatly influenced by the quality of these skilled individuals.

It was also in recognition of these needs that PETE was established in 1991 as a western states initiative to link participating community colleges with the technical resources of the DOE, EPA, DoD and NASA National Laboratories, federal and state agencies, private industry and professional societies. The underlying goals of PETE are to assist in the development and presentation of curricula for training environmental technicians, and to formalize linkages that encourage a greater number of transfer students to pursue studies in engineering, and environmental science and management at four-year institutions. Within the brief existence of PETE, the number of community colleges delivering environmental technology certificates and associate degrees has grown to an astonishing 40 within a three-year period.

It soon became apparent that the lack of appropriate, high-quality, and affordable educational materials in environmental technology, plus the insufficient number of quali-

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fied teachers in the field, are major stumbling blocks to the effective delivery of these programs. PETE took steps to address these obstacles by further broadening its collaborative base in early 1992, inviting INTELECOM – an internationally-recognized leader in the design and production of telecommunications-based instructional materials – to provide leadership for the development of core instructional materials that would have national application. It was from this collaboration that the *PRESERVING THE LEGACY* Project emerged.

The partnership is a natural one. Not only is INTELECOM a 25-year old nonprofit corporation formed by community colleges, it's "specialty" is the creation of award-winning science series – *Earth Revealed, The Mechanical Universe . . . and Beyond*, and *Oceanus*, to name several.

In 1993, what had begun as a western states initiative was officially extended to all fifty states, Puerto Rico and U. S. territories with the formation of national PETE. The national organizational structure incorporates six PETE regions – North Central, Northeast, Northwest, South Central, Southeast, and Western – with leaders from the six regions comprising PETE's Board of Directors. As one of their first orders of business, each of the six regions nominated an outstanding teacher to serve on the National Academic Council that guides the development of the *PRESERVING THE LEGACY* Project.

In 1993 INTELECOM and PETE took another major step in this collaborative effort by entering into an agreement with Van Nostrand Reinhold (VNR) to publish and distribute the textbooks developed in association with *PRESERVING THE LEGACY*. VNR is a mid-sized publisher that specializes in professional and academic books in several targeted areas including environmental and occupational health, safety, and engineering. The company was selected from among eight publisher candidates submitting proposals in response to an RFP, in part because of its commitment to work closely with project leaders to ensure close coordination between the print and video components of the project, in subsequent as well as initial editions of the textbooks. VNR has agreed to cover the costs of printing, publishing, binding, and distributing *affordable* texts in a cost efficient and timely manner. In addition, over the course of development, VNR will contribute $150,000 toward the project – a $50,000 grant, and a $100,000 advance against royalties.

The infrastructure that is now in place, the working relationships that have been forged, and the experience gained during the two-year start-up phase of this Project directly supports INTELECOM's ability to provide national leadership for carrying out the objectives of this proposal, the mandates of the ATE program for a systemic approach to technological education, and the efficient and effective use of NSF funds.

BUILDING THE FOUNDATION

To briefly summarize what has been accomplished to date through the collaborative efforts of INTELECOM and PETE: Early in 1992, PETE invited educational leaders in the environmental technologies to come together to probe the feasibility of a nationally-focused environmental technology instructional materials development project. The con-

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cept of collaboratively creating a core set of instructional materials that could be integrated into their programs was energetically endorsed.

Initially, INTELECOM staff members acquired and analyzed course syllabi from community colleges across the nation with programs in environmental technology. Next, they developed a matrix of elements common to a majority of programs. PETE facilitated the development by appointing a broad-based, nationally-balanced committee of curriculum/teaching specialists to work with INTELECOM in identifying curricular needs, designing core instructional units that would meet programmatic requirements, and establishing the scope of the work.

The design of each of the instructional units summarized below – developed over months of research and refinement – was subsequently reviewed by educators from colleges with environmental training programs, as well as technology and industry specialists, and received overwhelming approval from all groups. The plan, in its entirety, calls for the development of textbooks, integrated videos, laboratory guides, and teachers manuals for each of the following eight core units over a five-year period:

☐ **Introduction to Environmental Technology**

An Age-Old Problem . . . Governmental Processes . . . Basic Toxicology . . . Environmental Interrelationships . . . Air Quality . . . Water Quality . . . Land and Soil Use . . . Hazardous Materials . . . Occupational Safety and Health . . . Waste Generation . . . Hazardous Waste . . . Nuclear Waste . . . Pollution Prevention and Waste Reduction . . . Career Opportunities

☐ **Waste Generation, Reduction, Treatment, and Prevention**

Introduction to Waste Streams . . . Waste Stream Regulations . . . Applications of Waste Reduction and Treatment Technologies . . . Waste from the Metal Working Industry . . . Waste from the Plating, Finishing, and Circuit Board Industries . . . Waste from the Agriculture/Forestry Industries . . . Waste from the Petroleum Industry . . . Waste from Chemical Production . . . Waste from the Graphics and Printing Industries . . . Waste from Medical Industries . . . Waste from Mining Industries . . . Waste from Nuclear Industries . . . Waste from Hazardous Waste Cleanup and Treatment Industries . . . Waste from General Manufacturing Industries . . . Waste from Food and Beverage Industries . . . Waste from the Textile Industry . . . Waste from Surface Coating Industries . . . Waste from Consumer-related Industries . . . Waste from New and Emerging Technologies

☐ **Basics of Toxicology**

Introduction to Toxicology . . . Exposure and Entry Routes . . . Distribution, Metabolism, and Elimination of Toxics . . . The Dose-Response Relationship . . . Target Organ Effects . . . Reproductive Toxins, Mutagens, and Carcinogens . . . Survey of Common Toxic Substances . . . Risk Assessment . . . Mitigation Procedures in the Treatment of Toxicity

☐ **Basics of Industrial Hygiene**

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Types of Environmental Safety and Health Hazards . . . Exposure Limits . . . Monitoring of Toxic Substances . . . Exposure Control Methods . . . Workplace Safety . . . Medical Surveillance Program

☐ **Site Characterization, Sampling and Field Analysis**

Site Investigations . . . Sampling Approaches and Tools . . . Sampling and Sample Preparation . . . Sample Inspection and Characterization . . . Methods of Analysis . . . Quality Control and Data Interpretation

☐ **Environmental and Hazardous Materials Regulations**

Occupational Safety and Health Agency Regulations . . . Environmental Protection Agency Regulations . . . Department of Transportation Regulations . . . Nuclear Regulatory Commission Regulations

☐ **Contingency Planning and Reporting for Emergency Response**

Hazards Analysis . . . Contingency Plans for Community Response . . . Contingency Plans for Hazardous Waste Facilities . . . Hazardous Material Reporting Requirements . . . Training Employees and Auditing Contingency Plans . . . Other Reporting Requirements . . . Developing Contingency Plans

☐ **Safety and Emergency Response**

Hazard Recognition and Classification . . . Hazard Recognition and Work Site Safety . . . Health Effects of Hazardous Substances . . . Health and Safety Planning . . . Personal Protective Equipment . . . Selection of Respiratory Protection . . . Selection of Chemical Protective Clothing . . . Field Monitoring . . . Decontamination . . . Analyzing a Hazardous Event . . . Site Control and Containment . . . Confined Space . . . Handling Drums and Other Containers . . . Managing Emergency Operations . . . Field Exercises

THE AUDIENCE

The *PRESERVING THE LEGACY* materials are designed to be used in a variety of ways – even within a single institution – depending on the type of program, the teacher, and the students being served. Some teachers will use the video and teacher support materials to provide experiences and demonstrate processes not normally available in the classroom setting:

☐ close-up views of advanced technologies, new processes and techniques that will preserve and, in some cases, improve environmental integrity;

☐ the chance to witness hazardous episodes as they occur, and see the short- and long-term implications of such incidences on all forms of life as well as the environment;

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- ☐ the opportunity to work alongside those who attempt to reduce the damage that results from the improper use, disposal or transportation of hazardous materials, and to analyze, where possible, the comparative results of various mitigation techniques and approaches;
- ☐ the clarity and increased comprehension gained from seeing animated illustrations of processes that are otherwise difficult to understand or to see.

Some colleges may incorporate the modules within distance learning programs that link instructors and students through telecommunications. Still others may integrate the modules within training programs for business and industry.

In each instance, these commonly-sought learning modules will serve as critical building blocks for an infinite variety of curricular programs and educational delivery modes.

ACADEMIC LEADERSHIP

Academic leadership for *PRESERVING THE LEGACY* will be assumed by an Academic Team Leader assisted by a Core Academic Team of three master teachers, a National Academic Council, and a full-time instructional design specialist who will be part of the INTELECOM staff. The top four leadership positions for the project have been filled by faculty who were key leaders of the PETE National Curriculum Study Group: Academic Team Leader – Howard Guyer, Fullerton College; Core Academic Team – Ann Boyce, Bakersfield College; Douglas Feil, Kirkwood Community College; and A. J. Silva, Eastern Idaho Technical College. The National Academic Council is comprised of six master teachers, one from each of the six PETE regions: Northeast PETE – Douglas Nelson, SUNY Morrisville; North Central PETE – Eldon Enger, Delta Community College; Northwest PETE – Jerry A. Riehl, South Seattle Community College; Southeast PETE – William Engel, Central Carolina Technical College; South Central PETE – David Boon, Front Range Community College; and Western PETE – Steven Onstot, Fullerton College.

Members of the Core Academic Team and National Academic Council guiding the content development of the *PRESERVING THE LEGACY* units are recognized leaders in the field of Environmental and Hazardous Materials Technology training. They represent diverse but complementary fields of specialization, from waste water management and environmental health to mining and chemical waste management, and environmental law. They are acknowledged as distinguished teachers and curriculum developers, as specialists in private industry settings, and international consultants in environmental technologies. In the course of developing the video and text materials, Project leaders will also enlist the advice of other recognized specialists in advanced environmental technologies, both to appear on camera and to verify the absolute accuracy of the information that is presented.

Academic advisors play a *significant* role in the design and development of INTELECOM video programs and coordinated print materials. Through the years, this has been a source of surprise and delight – and, occasionally, shock and dismay – to advisors who have been asked to perform this role for other educational producers, and anticipate very limited involvement.

Members of the National Academic Council and the Core Academic Team will be intimately involved in:

- ☐ expanding upon the learning objectives established during the two-year research and design phase of the Project, and determining in greater depth the content base for each of the eight major instructional units.
- ☐ contributing to the instructional design of the video and print, suggesting approaches and contexts.
- ☐ selecting the most critical video modules to be developed in conjunction with NSF-ATE support.
- ☐ verifying the academic accuracy and relevancy of each aspect of the Project, at various stages of development:
  - script treatments and scripts
  - rough cuts of the videos
  - drafts of coordinated print materials (textbooks, laboratory exercises, faculty guides)
- ☐ sharing information about *PRESERVING THE LEGACY* with colleagues in their region; using these linkages to secure formative feedback that will increase the value of the product.
- ☐ evaluating the materials, both formally and informally with students.
- ☐ assisting in faculty in-service workshops to enhance utilization of the materials.
- ☐ determining when and if revisions to the products are necessary.

The development of exemplary instructional materials depends not only on the calibre of the people involved, but also the process that has been established to insure their meaningful involvement and integration. It is the symbiotic relationship among academic, design, and production leaders and their support staff that will be key to the successful implementation of the *PRESERVING THE LEGACY* Project. The diagram and brief summary of academic expectations, Figure 1 on the next page, illustrates the roles and responsibilities of the academic team and their relationship to various aspects of production.

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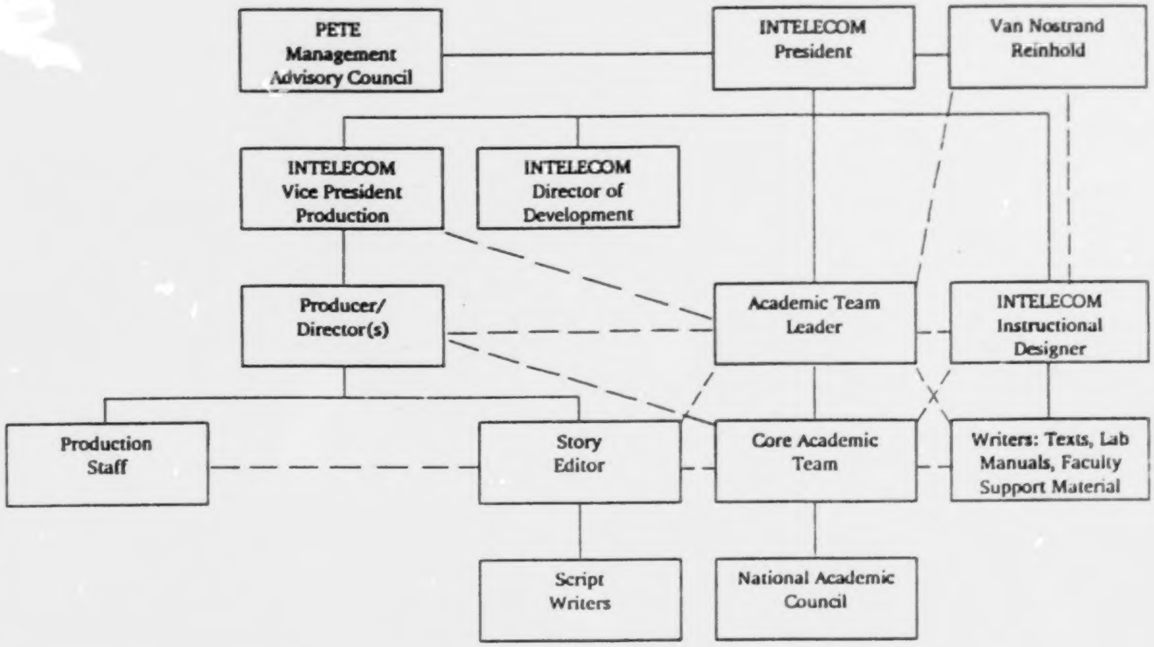
PRESERVING THE LEGACY
Interrelationships Among Development Team


PETE Management Advisory Council
INTELECOM President
Van Nostrand Reinhold
INTELECOM Vice President Production
INTELECOM Director of Development
Producer/ Director(s)
Academic Team Leader
INTELECOM Instructional Designer
Production Staff
Story Editor
Core Academic Team
Writers: Texts, Lab Manuals, Faculty Support Material
Script Writers
National Academic Council

Academic Team Leader

- Serves as the leader of both the Core Academic Team and National Academic Council groups.
- With the advice of colleagues, has final authority over content of the video and print materials developed for all of the modules/ projects.
- Helps plan and must attend Annual Design/Production Retreat, National PETE conference(s), and 2 additional meetings with INTELECOM staff per year.
- Assists the producer/director and production staff in suggesting locations, experts, etc. for each of the video tapes.
- Assists in decision making on segments that require animation or graphical treatment.
- Assists the story editor in compiling the writer's packet for individual programs.
- Reviews first and subsequent drafts of all scripts.
- Assists in determining video program lengths to be developed.
- Reviews the rough and fine cuts of each video program.
- Reviews all print elements developed in conjunction with the project.

Core Academic Team Members

- Similar responsibilities to those of the Academic Team Leader; however, responsibilities of each member are limited to one-third of the modules.
- Assists in the planning and must attend the Annual Retreat, National PETE Conference(s), and 2 additional meetings with INTELECOM staff per year.
- Assists the Academic Team Leader, producer/director, and production staff in suggesting locations, experts, and animation for the video tapes within their third of the project.
- Collects all comments and suggestions on print elements related to their third of the modules and forwards them through the Team Leader to VNR or INTELECOM writers/instructional designers.
- Assists Acadmic Team Leader and story editor in compiling the writer's packet for their third of the modules.
- Reviews first and subsequent drafts of all scripts related to their third of the programs.
- Reviews rough and fine cuts of their video programs.

National Academic Council

- Must attend Annual Retreat, National PETE Conference(s), and participate in occasional audio conferences.
- Identify and select approximately one-third of the scripts for which they will be willing to assume primary academic responsibility.
- Must return scripts by FAX, mail, or other creative delivery system within 5 to 7 days after receipt.
- Must also agree to review the integrated text materials that coordinate with the video scripts.

Figure 1

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Partnership for Environmental Technology Education

FORMATIVE EVALUATION . . . AN ON-GOING PROCESS

Evaluation is built into every aspect of an INTELECOM-produced product. It is the reason for the in-depth, comprehensive research that was initiated before the *PRESERVING THE LEGACY* project had shape or form.

It is the reason for creating an eclectic development team comprised of articulate, visionary, respected professionals in environmental technology, instructional design, and television production. At each significant juncture in the development process, as has been indicated, their advice is sought and respected.

It is the reason for maintaining close contact with end users throughout the development process – with the secondary and postsecondary institutions that will utilize *PRESERVING THE LEGACY* in their classrooms and distance learning programs, and with the businesses and industries that will rely upon the accuracy and relevancy of the information that is conveyed. The PETE organizational structure and support will be particularly valuable in maintaining this "connectedness," linking the Project to educational institutions and industry leaders in each of the six regions.

In addition to the careful evaluation of each aspect of *PRESERVING THE LEGACY* by the Core Academic Team and the National Academic Council as the materials are being developed, pilot materials will be field tested with a diverse population of students and teachers in association with the six PETE regions. Moreover, rough cuts of each module – video and text – will be reviewed by the Academic Team Leader and a member of the Core Academic Team before it reaches final stages of post production.

STRENGTHENING THE NETWORK: FACULTY ENHANCEMENT, PROMOTION, AND DISTRIBUTION ACTIVITIES

Because of the critical need for these educational materials, each unit will find its way into the educational marketplace as soon as it is completed. The affordable textbooks and laboratory manuals completed in conjunction with *PRESERVING THE LEGACY* will be distributed by Van Nostrand Reinhold, the Project's publishing partner. The video products and faculty guides will be distributed by INTELECOM at a projected cost of $40 per video to PETE-member colleges.

INTELECOM-developed educational videos are currently being used by over 2000 colleges and universities, and 2,500 high schools, in the United States and Canada. They are broadcast nationally by PBS and Jones Intercable's Mind Extension University network, and used for training by many of the nation's major business employers.

In addition to its North American distribution network, INTELECOM products enjoy widespread use in Australia, Europe, the Middle East, nations of the Pacific Rim, and South America. International marketing is accomplished primarily through a closely coordinated network of subdistributors whose employees are citizens of the countries they serve.

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The video segments produced as part of this proposal will meet the technical standards for network-quality video. They will be mastered in digital format, and produced with a closed-captioned option for the hearing impaired as well as a Spanish-language version.

In concert with the Partnership for Environmental Technology Education and members of the Academic team, yearly implementation workshops will be held for faculty, and business and industry representatives, in conjunction with national and regional meetings of the Partnership for Environmental Technology Education.

INTELECOM is unique among major producers of television-based learning materials. As a nonprofit corporation formed by colleges, the "stockholders" of the organization use the products that are created. Series producers must not only meet the quality demands of the marketplace, but the exacting standards of member colleges, faculty, and students close at home.

Perhaps it is this close link with the marketplace base that has fostered INTELECOM's reputation for user support. This ranges from quality control of videotape duplication, in a variety of formats, to the quick delivery of product and the provision of in-service training opportunities that assist secondary schools, colleges, and universities in the administration of exemplary distance learning programs.

CLOSING THOUGHTS

Perhaps the most compelling argument for *PRESERVING THE LEGACY* is that these exemplary materials will make a significant contribution to meeting an urgent national need – the need for environmental technicians.

A report issued earlier on *Environmental Management in the 90s*, a joint project of the National Association for Environmental Management, the Environmental Hazards Management Institute, and Coopers & Lybrand, a management consulting firm in Boston, Massachusetts, states:

> *There is nothing on the horizon to suggest that the regulatory storm will in any way subside – if anything, we would expect it to intensify as new hazards are discovered and consumer awareness increases. Given the current levels of resources and staffing as well as slowly changing organizational philosophies, it will be very easy for Environmental Management to continue to be compliance-focused. In many ways this is the safe course of action – reacting to changes, and continuing many of the behaviors and patterns that we observed. However, if the profession is going to come together, it needs to assume a leadership role in a number of different areas. While compliance will always be a major concern, the opportunity to be proactive may be a fleeting one.*

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Advanced Technological Environmental Education Center

HMTRI/PETE/UNI

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BBS 1-800-989-1266
BBS 1-319-398-1276

There is a rapidly growing need for advanced technology environmental education programs to prepare students for the workplace of today and tomorrow. To build a high performance environmental education infrastructure, the Hazardous Materials Training and Research Institute (HMTRI). Partnership for Environmental Technology Education (PETE), and the University of Northern Iowa's Center for Environmental and Energy Education will establish a national Advanced Technology Environmental Education Center (ATEEC). The vision is to create a world class network of community college environmental programs linked with high schools that inform and prepare students for entry into these two-year programs. The Center has established three broad goals: (1) Develop nationally validated curriculum models and advanced instructional materials; (2) Establish comprehensive programs of professional development; and (3) Build a clearinghouse to serve as a national center of environmental information and as a hub for the networking of environmental educators, business and industry, federal agencies, and professional societies. The Center will provide leadership to: enhance core and advanced math, science and technology components of environmental education; utilize advanced electronic communications networks; focus upon meeting the needs of diverse learners; encourage instructional materials which utilize advanced technologies; develop teaching and curriculum standards for environmental education. The ATEEC will touch hundreds of instructors and improve the education of thousands of students throughout the nation.

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PROJECT DESCRIPTION:

SECTION 1: VISION, NEED, AND MISSION

VISION

The world is undergoing a period of technological revolution which many believe will be as widespread in its effects as was the industrial "mass production" revolution of nearly a century ago. The National Center on Education and the Economy, in its report, "America's Choice: High Skills or Low Wages," labels these changes "the third industrial revolution;"[1] while the Hudson Institute publication, "Workforce 2000, Work and Workers for the 21st Century," labels this the "post industrial information era."[2] Whatever the label, there is broad agreement that if the U.S. is to maintain a position of economic and political leadership in the world, there must be fundamental changes in the workplace and in the educational programs which support the workplace.

In recent years there has been broad political consensus on this need for change. President Reagan in his 1987 State of the Union address said, "The quest for excellence into the twenty-first century begins in the classroom, but we must go next to the workplace."[3]

In 1989 President Bush and the nation's governors, in an attempt to provide a framework for action, established the National Education Goals. The link between education and the economy was clearly stated by the chair of the National Education Goals Panel, who wrote, "Education is as important to our global economy in its implications for a competent workforce as availability of capital or any other business condition."[4] President Clinton, on the occasion of the establishment of the President's committee of Advisors on Science and Technology stated, "Science and technology are essential tools for achieving this administration's goal for strengthening the economy, creating high quality jobs, protecting the environment, improving our health care and education systems and maintaining our national security. This country must sustain world leadership in science, mathematics and engineering if we are to meet the challenges of today...and of tomorrow."[5] Emphasizing the theme of empowering workers, Labor Secretary Riech states, "American companies have got to be urged to treat their workers as assets to be developed rather than costs to be cut."[6] Representative Lee Hamilton, Vice Chairman of the Joint Congressional Economic Committee states, "For an advanced country such as ours, the only sustainable advantage is a talented and adaptive workforce capable of using the latest technologies and reaching ever higher levels of productivity."[7] The National Education Goals Report entitled Building a Nation of Learners concludes, "All workers must have the opportunity to acquire the knowledge and skills needed to adapt to emerging technologies, work methods, and markets, through vocational, technical, workplace and other programs."[8]

A consensus has been built that the key to maintaining or increasing the economic productivity of the country lies in the creation of high performance work organizations which are supported by high performance educational programs. Such organizations are characterized by a willingness to adopt new technology, flexibility in organizational structures, accountability, and the empowerment of employees.

While political leaders can create a vision, educators must design new educational programs that adequately prepare students for the expanded skills, knowledge and understanding required in the changing workplace. Our vision is to create a national, world class network of community colleges supported through public-private partnerships that is producing and maintaining the environmental technology workforce addressing the diversified needs of industry and promoting the progression of transfer students to higher education. This must be a network that is mutually supportive, allows ready access to advanced instructional methodologies and is kept current with evolving environmental technology. The Advanced Technology Environmental Education Center (ATEEC) will be a critical step in advancing this vision.

NEED FOR ADVANCED TECHNOLOGY ENVIRONMENTAL EDUCATION CENTER (ATEEC)

There are two major components to establishing the need for the ATEEC. The first component relates to the issue of capacity. Simply stated the issue is, do sufficient environmental education programs exist today to prepare the numbers of technicians required to meet current and projected workforce needs? The second component of need relates to the issue of quality and advancing technology. Is the United States developing quality, high performance environmental technology programs to prepare students for the demands of the emerging high performance workforce?

The first issue is that of capacity. A generally recognized and frequently repeated assertion expressed by environmental educators and environmental practitioners is the need to train substantially more environmental technicians.

In 1992, a study published by the Bureau of Labor Statistics concluded that employment for technicians within the scientific and technical fields would increase 32% from 1990 to 2005.[9] Ferrier, in a study of employment trends in the environmental services industry, concluded that between 1992 and 1995 employment opportunities in environmental companies would increase by 60%.[10]

The National Center for Research in Vocational Education, University of California, Berkeley, has undertaken the most complete occupation specific study to date.[11] Under sponsorship of the U.S. Department of Education and the Department of Energy, the study assessed current and projected needs for environmental hazardous materials technicians and the extent to which those needs are being met. The study arrived at the following conclusions:

1. The supply of trained technicians in the environmental field is inadequate,
2. The demand for environmental technicians will increase at a moderate to substantial rate,
3. The community college is the preferred provider of technician education,
4. Technicians should possess knowledge of science and math including algebra and trigonometry,
5. Increased enrollment capacity and new program development are needed at community colleges,

6. Community college environmental programs should link with high schools to encourage enrollments,

7. The establishment of partnerships between industry and education is critical to the success of environmental education programs.

Based upon the available evidence, it is reasonable to conclude that the need for environmental technicians will substantially increase.

The second component of need relates to the issues of technology and program quality. Vice President Al Gore in describing the administration's Technology for America's Economic Growth initiative recently said, "Technology offers new opportunities for jobs, for a cleaner environment, for better schools, for high-quality health care and for scores of other advances. We must move to seize these opportunities."[12] Unfortunately, few two-year college environmental program instructors are ready to "seize these opportunities." Based on surveys conducted by regional Partnership for Environmental Technology Education (PETE) organizations, fewer than 10 percent of environmental technology instructors use any form of electronic information technology. Just over 20 percent report access to the Internet system somewhere on their campus, but few indicate use of the system for instructional information.

Despite widespread publicity regarding telecomputing, communication technology of any sort is almost nonexistent in environmental technology programs in two-year colleges. Most two-year colleges have invested in computers and computer labs which make computer facilities accessible to staff and students. However, few use communication technology to access computer networks or databases. Simply stated, communication technology is missing from the arsenal of instructional delivery methods used to support environmental technology education in the two-year colleges.

Development of technician-level environmental education programs has generally occurred in isolation. Programs have been developed with the assistance of local advisory boards and are responsive to immediate local needs and concerns. As the level of technology advances, it is critical that student preparation for environmental technology careers encompass a strong foundation in math, science and technical skills. This foundation will allow technicians to adapt their acquired skills and knowledge to the ever changing demands of tomorrow.

MISSION OF ATEEC

The field of environmental education is a new and emerging area not yet well established. Because of this, a heightened opportunity exists to create environmental education programs designed to prepare students for the emerging high performance work settings of tomorrow.

The need to build a stronger environmental education infrastructure is clear. To do this, science, math and technical curricula, and instructional materials which support advanced environmental technology education must be strengthened; professional development opportunities for community college and secondary school educators must be enhanced; and, effective support services for program improvement must be provided.

An "information superhighway" is part of the future of environmental education in the two-year college. Advanced communications technologies will provide both instructors and their students the information and resources they need for a challenging future of lifelong learning. Such resources when tied to an instructional foundation based on leadership in basic science, mathematics, and technology will provide an environmental workforce to meet today's and tomorrow's challenges. This workforce will be able to face new environmental challenges from the nation's businesses and industries as well as from around the world. The ATEEC project will team the technologies (software, computer and communications equipment) with the classroom instructor to increase the productivity of learning.

To build this environmental education infrastructure, the Hazardous Materials Training and Research Institute (HMTRI), the Partnership for Environmental Technology Education (PETE), and the University of Northern Iowa's Center for Environmental and Energy Education (including the College of Natural Sciences, the Department of Environmental Education, and the Iowa

Waste Reduction Center) will establish, in partnership, an NSF Advanced Technology Environmental Education Center (ATEEC).

ATEEC's mission is to advance environmental technology education through curriculum development, professional development, and program improvement in the nation's community colleges and secondary schools. The Center will draw upon the resources of its partner institutions, business and industry, federal agencies and laboratories, and professional societies to accomplish its mission.

GUIDING PRINCIPLES OF THE CENTER: The ATEEC will be guided by principles, assumptions and beliefs similar to those which provide the foundation for operation of HMTRI. These include:

1. The design of the Center presumes that community colleges acknowledge that they cannot be "stand alone" educational institutions capable of meeting all the educational needs of their local community. Rather the Center will encourage institutional networking and sharing of resources.
2. The Center will develop and promote advanced environmental technology programs which fulfill two requirements. The first is to meet the educational/technical needs of today; the second is to provide education for tomorrow--equipping students with the tools to master the ever changing conditions and technologies. While community colleges have historically had a clear mission to transmit the skills and knowledge needed to meet current demands of the workplace, it is now critical that community colleges insure that students master science, math, technology, communication and critical thinking skills allowing them to adapt to future demands their profession will place upon them.
3. The Center will utilize advancements in educational methodology and technology to better serve the needs of students. Exciting educational tools such as CD-ROM, computer simulation, and multimedia are becoming available and will be utilized where they are

feasible and educationally advantageous.

4. The Center will develop instructional materials which can be delivered via distance education systems such as fiber optics, microwave, satellite, or combinations of these technologies. This allows for the portability of the educational experience to areas with few students, and to locations where instructors lack certain technical competencies.

5. The utilization of communications technology to connect individuals and institutions involved in environmental education by means of the "information superhighway" will create a powerful new learning community which will support and greatly enhance the overall quality of environmental technology education.

6. The Center will be organized to build quality into all the processes of the Center, not simply to check for and correct quality problems as they are detected in the final products of the Center.

SECTION 2: GOALS AND OBJECTIVES

GOAL 1: Strengthen science, math and technical curriculum, and instructional materials which support advanced environmental technology education.

OBJECTIVE 1: Identify knowledge and competency requirements in core and advanced math, science and technology needed by: high school graduates entering two-year environmental technology programs; two-year environmental program graduates entering the workforce; and, two-year environmental program graduates transferring into a four-year institution's environmental science/ technology program. Project the knowledge and competencies required by tomorrow's environmental technicians.

OBJECTIVE 1 KEY OUTCOMES: A directory of occupational competency profiles will be established. A minimum of six new nationally validated competency profiles will be developed. A competency profile of the projected skill requirements for environmental technicians will also be developed. The knowledge base needed by technicians, high school graduates entering two-year environmental programs and two-year graduates transferring to four-year institutions will be defined.

OBJECTIVE 2: Enhance environmental education curriculum by developing curriculum models for a range of two-year environmental technology programs; and, develop a model course sequence for high school students entering two-year programs.

OBJECTIVE 2 KEY OUTCOMES: A directory of existing curriculum models, new curriculum models, and model course sequences will be developed.

OBJECTIVE 3: Identify needs for new courses, instructional materials, and methodologies that will enhance environmental technology programs.

OBJECTIVE 3 KEY OUTCOMES: Needs will be identified and proposals developed to upgrade existing courses, create new discipline specific courses, develop hybrid (interdisciplinary) courses, and provide supplementary instructional materials. Pedagogical designs that accommodate needs of diverse learners

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will be employed. The majority of these needs will be satisfied through NSF or other funding mechanisms.

OBJECTIVE 4: Develop a community college institutional self-assessment instrument for the purposes of; 1) determining whether college environmental programs meet the science, math, and technical core requirements identified by the project; 2) assessing whether program content and instructional technologies are up-to-date; and, 3) assessing whether the program is meeting the regional needs of business and industry.

OBJECTIVE 4 KEY OUTCOMES: A self-assessment instrument will be developed and used by community colleges with environmental technology programs. A survey will be conducted to determine the effectiveness of the instrument.

OBJECTIVE 5: Promote linkages among high school, community college, and four-year college environmental education programs (2+2+2) which will: insure high school students are prepared to enter two-year environmental programs; insure two-year graduates are prepared for the demands of the workplace; insure two-year environmental science transfer graduates are prepared to enter baccalaureate programs; and, insure maximum communication and coordination among the three levels of education providers.

OBJECTIVE 5 KEY OUTCOMES: Model 2+2+2 linkage programs will be developed. Workshops promoting 2+2+2 will be held and participants will be surveyed to determine the effectiveness of the workshops in promoting successful 2+2+2 linkages.

OBJECTIVE 6: Establish an NSF advanced environmental technician education Fellows program to carry out activities which support and strengthen environmental education.

OBJECTIVE 6 KEY OUTCOMES: Thirty Fellows will be identified to participate in an annual two-week summer institute and to carry out activities as defined by the Curriculum Council. Five Fellows will be identified from each PETE region. Participation of underrepresented groups will be assured. Of the 30 Fellows, 10 will be math and science community college faculty, 10 will be community college environmental faculty, and 10 will be high school math and science instructors.

GOAL 2: Strengthen the nation's environmental technician programs through provision of professional development opportunities for community college and secondary school educators.

OBJECTIVE 1: Conduct six annual Professional Development Instructors' Conferences, on a regional basis, for the purpose of:

1. Developing instructors' environmental technology skills and knowledge,
2. Introducing environmental technician competency profiles, model curricula, 2+2+2 articulated programs, and other accomplishments of this project,
3. Introducing new instructional methods and materials including the teaming of computer, software, and communications technologies for classroom instruction,
4. Developing instructors' telecomputing capabilities, thereby improving access to educational resources,
5. Facilitating technology transfer as well as educator, industry, professional society, governmental laboratory, and agency networking,
6. Disseminating information about ATEEC and the assistance to educators and students available through the Center.

OBJECTIVE 1 KEY OUTCOMES: A minimum of 600 environmental technology educators and practitioners will attend Professional Development Conferences annually. They will report advances in skills, knowledge and contacts leading to strengthened environmental technology education.

OBJECTIVE 2: Facilitate summer internships for community college and secondary educators and students in industry, governmental agencies, and federal laboratories for the purposes of:

1. Exposing instructors and students to advanced environmental technologies,
2. Providing an "on-the-job" environment to help instructors and students use academic knowledge in work applications,
3. Helping instructors see practical, "hands-on" applications of knowledge that may be taken back to the classroom,
4. Creating an exchange of knowledge and discussion between educators, students and practitioners.

OBJECTIVE 2 KEY OUTCOMES: Opportunities for internships will be identified regionally, and information about funding opportunities will be made available to educators and students. A minimum of 15 interns will be placed in FY 1995 with the number of placements increasing each year.

OBJECTIVE 3: Utilizing the ATEEC infrastructure, establish a framework for development and promulgation of national curriculum and teaching standards for two-year environmental programs.

OBJECTIVE 3 KEY OUTCOMES: The Professional Development Council of ATEEC will utilize consultants familiar with the National Council of Teachers of Mathematics (NCTM) work on standards to review and report on the infrastructure required to develop standards in the field of advanced environmental technology. The Professional Development Council will develop a plan of action to address the issue.

GOAL 3: Strengthen advanced technology environmental education through provision of support services for program improvement.

OBJECTIVE 1: Establish an ATEEC Clearinghouse for the purposes of:

1. Providing Internet-accessible electronic databases of environmental programs, instructional resources, and new technologies,
2. Promoting electronic and print communications among environmental students, educators, industry, agencies, and federal laboratories,

3. Publishing an ATEEC Tabloid News for print communication and information dissemination,

4. Establishing a physical library of instructional resources.

OBJECTIVE 1 KEY OUTCOMES: A minimum of 300 educators will acknowledge that the ATEEC Clearinghouse services have strengthened environmental technology instructor skills and programs; electronic records will show the Clearinghouse to have logged 2,000 requests for information from educators, students, and industry; a minimum of 5,000 educators will receive the ATEEC Tabloid News.

OBJECTIVE 2: Promote use of the ATEEC Clearinghouse and educator/student/industry/agency and federal laboratory involvement in ATEEC activity by:

1. Establishing a 1-800 number for environmental educators and others to access ATEEC information and receive assistance in navigating Internet resources,
2. Building educators' capability in telecomputing, electronic information access and utilization,
3. Exhibiting at conferences of educators and environmental professionals,
4. Publishing in professional journals.

OBJECTIVE 2 KEY OUTCOMES: Data collected will indicate a majority of the nation's environmental technology educators will know of ATEEC and make requests for information and/or inquire about becoming involved.

Some Ways that P2 Programs and Manufacturing Extension Centers can Cooperate

REFERRALS: The state P2 program and extension centers establish referrals to one another and sometimes perform joint assessments.

DIFFERENTIATION: The state P2 program and the manufacturing extension centers differentiate in the type of P2 assistance they offer.

INTEGRATION: The state P2 program is an integral component of a manufacturing extension center. See example below left.

COMBINATION: A state P2 program receives funding through a sub-contract from the manufacturing extension center in its state, yet remains autonomous.

As of June 1994, some type of coordination has been initiated in states such as Minnesota, New York, Ohio, Tennessee, and Wisconsin. The writeup at left summarizes Tennessee's effort:

The Center for Industrial Services (CIS) at the University of Tennessee is one model of NIST/State P2 Program interaction. NIST is partnering with the state regulatory authority, the Tennessee Department of Environment and Conservation (TDEC) to fund CIS.

NIST recently awarded CIS $3.2 million to increase CIS's extension network. CIS is almost doubling the number of environmental engineers on staff as a result of the award. Smiley Clapp, Assistant Director of CIS, spoke of the strengths of the NIST/TDEC joint venture: "Industry views us as a resource. We exist to help business. We have industry trust."

Manufacturing Extension Partnership Information

For more information on MEP Extension Centers and planning activities in your area, call 301·975·5020. This number is a central line for MEP.

State Pollution Prevention Programs Information

For more information on state pollution prevention programs in your area, call:

National Roundtable of State Pollution Prevention Programs' Executive Director, Natalie Roy
202·543·P2P2 (7272)

or contact the Pollution Prevention Information Clearinghouse at 202·260·1023 to request a copy of EPA's *Reference Guide to Pollution Prevention Resources.*

Pollution Prevention
THE NATIONAL ROUNDTABLE OF STATE POLLUTION PREVENTION PROGRAMS

July 1994

NIST • EPA

Cooperating to Achieve a Clean and Competitive Future for Smaller U.S. Manufacturers

NIST • EPA

U.S. Department of Commerce
Technology Administration
National Institute of Standards and Technology
Manufacturing Extension Partnership

U.S. Environmental Protection Agency
Office of Pollution Prevention and Toxics
Pollution Prevention Division

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"The NIST manufacturing extension centers and the state pollution prevention programs should take full advantage of opportunities to achieve their mutual goals of environmental protection and economic competitiveness by exploring partnership options."

Dave Kling, Director
Pollution Prevention Division, EPA

Smaller manufacturers face many challenges, but few are as great as the need to be both competitive and environmentally sound. For those working to support firms' efforts to become environmentally competitive, reaching out to the more than 350,000 smaller manufacturers is an enormous logistical challenge.

The National Institute of Standards and Technology (NIST), the National Roundtable of State Pollution Prevention Programs, and the Environmental Protection Agency (EPA) believe that the Manufacturing Extension Partnership (MEP), through its manufacturing extension centers, can better assist companies in meeting this challenge by cooperating with state pollution prevention programs, where appropriate.

NIST and EPA encourage cooperation between the state pollution prevention programs and MEP manufacturing extension centers in the interest of effectively and efficiently helping smaller manufacturers become environmentally competitive.

The NIST Manufacturing Extension Partnership

”

"A fundamental principle of MEP is to leverage resources wherever possible. State pollution prevention programs and manufacturing extension centers represent a clear opportunity for high impact collaboration."

David Gold, Regional
Manager and
Environmental Projects
Manager, NIST MEP

The mission of the MEP is to strengthen the global competitiveness of smaller manufacturers. In the long run, this mission cannot be achieved unless smaller manufacturers are empowered to become environmentally sound while improving their competitiveness.

The MEP is achieving its mission by establishing a national network of not-for-profit manufacturing extension centers which provide technical assistance to smaller manufacturers. These extension centers are built on existing state and local efforts through a competitive process. As of April 1994, there are 35 manufacturing extension centers.

The national manufacturing extension system is linked together and to multiple sources of information through the MEP Links electronic network. To assist states in planning and implementing manufacturing extension activities, NIST also awards competitive planning grants to states.

State Pollution Prevention (P2) Programs

“

"Pollution prevention is all about networking. MEP's centers, working with state and local P2 programs, will help shape a cleaner and more competitive manufacturing sector."

Philip Cherry,
Chairperson, National
Roundtable of State P2
Programs, and
Program Administrator,
State P2 Programs,
Delaware Department
of Natural Resources
and Conservation

Since 1989, a major expansion of state P2 programs has taken place. Today, virtually every state has a pollution prevention program. State P2 programs meet their objectives both through voluntary and regulatory incentives.

Many states are now integrating innovative, multi-media P2 efforts into their existing state environmental regulatory programs.

The state programs that offer technical assistance help industry identify P2 opportunities, often with a focus on small businesses. These technical assistance programs offer free, confidential, non-regulatory, on-site pollution and waste assessments; telephone assistance over a hotline; or referrals to industry-specific publications.

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ENVIRONMENTAL PROJECTS

STATUS REPORTS

July 26, 1994

NIST MANUFACTURING EXTENSION PARTNERSHIP

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    Environmental Strategy Goal Number: 1.4, 2.1, 2.3

DOE Environmental Visiting Staff

Environmental Strategy Goal Number: 2.2
Timeframe : August 1994 - August 1995

Background:

In order to increase the coordination and integration of DOE laboratories' environmental activities into the MEP it will be useful to have a full-time DOE laboratory employee resident at NIST. The DOE Savannah River facility has expressed an interest in such an arrangement.

Key Objectives(Draft):

- Assessment of the most significant environmental constraints impinging the competitiveness of manufacturers within two to four important industrial processes.
- Compilation of a broad inventory of environmentally-related expertise and resources at major DOE facilities.
- Compilation of process-specific inventories of environmentally-related expertise and resources at major DOE facilities
- Cooperation with the Environmental Protection Agency temporary staff person on assignment to MEP in exploring the barriers to commercialization of environmental technologies and the potential development of a pilot project in this area.
- Assisting in review of competitive proposals for environmentally-related MEP projects and provide input and comments on other activities of the MEP Environmental Projects Group.

Update:

A statement of work is being negotiated for a visiting staff person from Savannah River. The deliverables in this draft plan are summarized above.

Project Contact: N/A
MEP Contact: David Gold, 301-975-5020
Funding Level: $N/A

Energy, Environment, Manufacturing Technology Access

Environmental Strategy Goal Number: 3.3 and 3.5
Timeframe : March 1994 - March 1996

Background:

The Energy, Environment, Manufacturing (EEM) Technology Access Project is a joint effort of NIST, the NIST Great Lakes MTC, the NIST Midwest MTC, EPA, DOE, the Northeast-Midwest Institute and several industry associations. The project is managed by NIST with funding from the Advanced Research Projects Agency's Technology Reinvestment Project. The overarching goal of the project is to create tools and methodologies which will enhance the ability of smaller manufacturers and technical assistance providers to identify, in an integrated fashion, the key areas in their operations which can have a positive impact on energy efficiency, environmental soundness or competitiveness. Once created and piloted, these tools will be disseminated to other extension organizations.

Key Objectives:

- Integrated environmental, energy efficiency and manufacturing competitiveness assessment methodology. This tool will enable field engineers at NIST extension centers to more comprehensively assess a manufacturer's operations.
- Streamlined self-assessment tool which smaller manufacturers can use independently to obtain a first-cut comprehensive assessment of their manufacturing operations.
- Pilot test assessment methodologies and disseminate tool to other technical assistance organizations.
- Environmental and energy efficiency benchmarking tool as a companion to an existing competitive benchmarking tool for certain metal finishing and metal stamping SIC codes.

Update:

Early stages of this effort have been focused on planning the details of carrying out a successful project and hiring some additional key staff members. Initial information has begun to be gathered on existing manufacturing assessment methodologies which will serve as the foundation for the integrated tool.

Project Contact: Ken Saulter 313-769-4234
MEP Contact: David Gold 301-975-5020
Funding Level: FY94 $2.44M ($1.01M NIST/TRP, $1.43M match)
FY95 $2.81M ($1.02M NIST/TRP, $1.79M match)

Environmental Legislation

Environmental Strategy Goal Number: 1.1, 2.1 AND 2.2
Timeframe: Ongoing

Background:

In the past few years, the debate over environmental policy has shifted as firms and governments increasingly agree that environmental sustainability is important for long-term economic growth. In contrast to the resentment of past years, in which the prevention of pollution often was treated as a burden, a consensus is emerging that industrial competitiveness can be enhanced thorough the integration of principles of environmental sustainability. Continued innovation in environmental technologies and environmentally sustainable manufacturing are seen as a route to greater productivity, new markets, and long-term viability.

The Environmental Technology Act of 1994 takes steps toward joining the goals of environmental protection and economic growth by leveraging innovation in a more proactive relationship with industry. Major provisions include: (1) improving the coordination of federal research, development, and demonstration of environmental technologies; (2) promoting environmental technology development, and demonstration; (3) encouraging innovation by improving the ability of firms to verify the performance of new environmental technologies; (4) increasing national awareness of the opportunities of environmental technologies; (5) improving the technical basis for evaluating environmental technologies.

Key Objectives:

- Track legislation through the current congress.
- Initiate and follow through on MEP comments on language suggestions/changes.

Update:

HR 3870 is scheduled for House floor action on Tuesday, July 26, 1994. Its Senate companion S 978, passed the Senate on May 11, 1994 with a vote of 85-14, vote #108.

Project Contact: N/A
MEP Contact: Linda Acierto, 301-975-5033
Funding Level: N/A

Environmental Tools & Resources

Environmental Strategy Goal Number: 3.1, 3.2, 3.3, and 3.5
Timeframe : Ongoing

Background:

No individual whether from a manufacturing company or a technical assistance organization, can be expected to be an expert in everything. This is certainly true on environmental issues. Implementing the best technologies or techniques which will enable a manufacturer to be environmentally sound in the most competitive manner requires a process of identifying problems and opportunities and then searching for details on alternatives. The MEP must empower both technical assistance providers and manufacturers with the tools and resources they need to do this.

Key Objectives:

- Enhance methodologies for assessing manufacturing operations and identifying key environmental issues and opportunities in the context of maintaining or increasing the company's competitiveness
- Increase the availability of tools which allow manufacturers to compare their environmental soundness with other manufacturers in their industrial sector.
- Increase access to easy to use, reliable and up-to-date environmental information on alternatives, technical considerations, cost considerations, as well as environmental risk and regulatory information.

Update:

MEP has already initiated a major project which is developing an integrated environmental, energy efficiency and competitiveness manufacturing assessment methodology as well as environmental benchmarking tools for some metal industry sectors. The MEP will be running a competition in the Fall of 1994 for the creation of environmental tools and resources. $2.5M will be available for this competition but these funds will be used in the same competition to fund integration projects as well. In addition, a separate $450k will be competed for the creation of a pilot environmental resource center for the metal finishing industry.

Project Contact: N/A
MEP Contact: David Gold, 301-975-5020
Funding Level: FY94 $2.44M ($1.01M NIST/TRP, $1.43M match)
FY95 up to $6.06M ($2.0M EPA, $1.25M NIST, 1.02M NIST/TRP, $1.79M matcl
(Actual amount in FY95 will be dependent on the proportion of funds ultimately devoted to these types of projects in the joint competition with integration projects being run).

Environmental Training

Environmental Strategy Goal Number: 1.4, 3.5
Timeframe : June, 1994; multi-year project

Background:

Although a very good general competitiveness assessment training package is being developed, modules need to be examined or separate training programs need to be developed in order to increase the field engineers' knowledge and awareness of environmental problems and issues.

Key Objectives:

- To ensure that all technical assistance personnel are aware of environmental opportunities and issues within small manufacturing plants at a basic level.
- To offer more in-depth environmental training to environmentally-interested field engineers to keep them abreast of the latest developments.
- Train-the-trainer workshops will be a part of the scope of work so that field engineers are able to participate and thereby train the small businesspeople so that they can train their workers to prevent pollution.

Update:

MEP is creating a series of sessions for the November meeting of the National Pollution Prevention Roundtable. These sessions are being designed for both the industrial extension service agents and state pollution prevention agents.

Other environmental training efforts are occurring such as MAMTC's pollution prevention for smaller manufacturers interactive telecast and GLMTC's telecasts on "alternatives to spray painting" and "switching to aqueous based cleaning solutions."

MEP is currently working with RPI to create a five day core curriculum. Environmental concerns will be presented through examples and case studies throughout the course.

Project Contact: N/A
MEP Contact: Krista Johnsen, 301-975-5104
Funding Level: To Be Determined

Integrating Environmental Services into MEP Centers

Environmental Strategy Goal Number: 1.1
Timeframe : Beginning Fall of 1994

Background:

In the long run, the MEP will have difficulty carrying out its mission unless it enables smaller manufacturers to be environmentally sound while remaining competitive. For this reason, it is essential that MEP's rapidly growing infrastructure of extension centers be leveraged to provide environmentally-related technical assistance to smaller manufacturers.

Key Objectives:

- Integrate environmental services into at least 90% of extension centers by 1997.
- Ensure that integration is done in a way which leverages other existing local resources.
- Ensure that environmental services are a portion of a field engineer's portfolio rather than just an adjunct activity of an extension center.

Update:

In the Fall of 1994 a competition will be run to fund the pilot integration of environmentally-related services into MEP extension centers. $2.5M will be available for this competition but these funds will be used in the same competition to fund environmental tool and resource development projects as well. The typical project probably being in the $200k-$400k range.

Project Contact: N/A
MEP Contact: David Gold, 301-975-5020
Funding Level: Up to $2.5M in FY95 ($1.5M EPA and $1.0M NIST)
(Actual amount in FY95 will be dependent on the proportion of funds ultimately devoted to these types of projects in the joint competition with integration projects being run).

Integration with STEP Planning Process

Environmental Strategy Goal Number: 2.3
Timeframe : Continuous

Background:

The MEP's State Technology Extension Program (STEP) planning grants provide the opportunity for states to conduct a thorough strategic planning process for their state's manufacturing extension system. These activities allow a state to create a coordinated extension effort which leverages existing resources to the greatest exten feasible. Environmental issues typically are identified as a technical assistance need of manufacturers during such a strategic planning effort. Thus, STEP planning grants provide an opportunity to plan the environmental aspects of a comprehensive state manufacturing extension effort.

Key Objectives:

- Educate MEP Regional Managers about the importance of addressing environmental issues as part of a state's strategic planning process for manufacturing extension services under STEP grants.
- Include reference to environmental issues as an example in future STEP solicitations.
- Mail MEP Environmental Strategy to all STEP planning award winners.
- Mail state pollution prevention program contact list to each STEP award winner and vice versa.

Update:

Regional Managers have been briefed on the Environmental Strategy. Once cooperative agreements are completed with the current round of STEP planning award winners, copies of the environmental strategy will be sent with a letter encouraging them to consider environmental issues.

Project Contact: N/A
MEP Contact: David Gold, 301-975-5020
Funding Level: $N/A

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Interactive Satellite Telecasts

Environmental Strategy Goal Number:1.3
Timeframe : Continuous

Background:

The NIST MEP is currently funding a project which will provide 14 interactive satellite telecasts per year. Each telecast will be 2-3 hours in length and offers the opportunity for viewers to ask questions from a live panel of the presenters. A dozen of these will be on topics of interest to smaller manufacturers and will be downlinked to the MEP extension centers. The remaining two will be focused on topics of interest for the field engineers themselves. The objective is to leverage this media for delivery of environmentally-focused interactive satellite telecasts.

Key Objectives:

- Two interactive satellite telecasts on Total Cost Accounting during FY 1995. The first will be targeted at field engineers; the second for smaller manufacturers
- Expansion of the interactive satellite telecast series to include an environmentally focused component.

Update:

EPA has committed to funding the two telecasts on Total Cost Accounting. Funds will be requested through EPA's Environmental Technology Initiative for approximately three telecasts per year on environmental issues.

Project Contact: N/A
MEP Contact: David Gold, 301-975-5020
Funding Level: FY95 $150K (from EPA).

Los Angeles Area Pollution Prevention Center (PPC)

Environmental Strategy Goal Number: 1.1 & 5.1
Timeframe : February, 1994; 2 year project

Background:

IRTA, the Institute for Research and Technical Assistance, is a non-profit established in 1990, in Santa Monica, California. IRTA applied for a TRP award in 1993 to create a Pollution Prevention Center to provide technical assistance to help smaller manufacturers in the L.A. Basin in reducing or eliminating their use of solvents in a variety of applications. In IRTA's proposal, PPC had one state and four local regulatory agencies as well as a large utility among its supporters. PPC's cooperative agreement became effective on February, 1994.

Key Objectives

- 15 firms will undergo intensive on-site technical assistance to eliminate their use of solvent-based cleaners.
- Case studies will be written from these 15 interventions.
- 10 demonstrations of emerging technologies will occur.
- Interaction with regulators to modify state and local regulations will occur.
- An outreach program will be created which includes a quarterly newsletter and conferences.

Update:

Since February 9, the Center has focused its efforts on forming an advisory committee and holding the first of the committee's quarterly meetings; finalizing its operating plan; getting its financial management system on-line; and getting its proposed projects underway. The two-year proposed projects are split into the following categories: bath cleaning and handwipe, adhesives, dry cleaning, wood products industry, and aerospace subcontractors.

IRTA has recently created a participant contract policy as well as a membership program. The participant contract contains the following five elements: 1. a description of the work to be done, 2. a space to assign company personnel to the project, 3. an agreement, signed by upper management, to commit and provide resources to identifying and testing alternatives, 4. a disclaimer which holds PPC harmless for conversions/ decisions, and 5. a budget and timeframe estimate for the project. The membership program will charge a one-time fee to firms to receive assistance and/or the PPC's publications. The following four categories for membership: are proposed member, test participant, honorary member, and subscriber.

Project Contact: Katy Wolf (310) 453-0450
MEP Contact: Krista Johnsen (301) 975-5104
Funding Level: FY94 $365,000 ($94,000 NIST/TRP, $94,000 match, $177,000 non-match resources)

National Environmental Resource Centers

Environmental Strategy Goal Number: 3.4
Timeframe: Beginning in Fall 1994

Background:

An enormous amount of environmental information is available through multiple means today. However, given a specific issue, it is very difficult to quickly find reliable technical information. To overcome this problem will likely require individual organizations with a mission of providing access to accurate, up-to-date and easily accessible environmental information. For these organizations to be successful they will need to focus on specific industrial sectors or processes. A major goal of a resource center would be to make such information available through user-friendly, internet-accessible systems. In addition, information would likely be available by phone, fax and printed material. In general, the center will gather, or create access to, information from other sources to build it's information base. However, when no good source of a needed type of information appears to exist, the center may take steps to catalyze the development of the needed data. Finally, the resource center will publish periodic reports on environmentally-related R&D needs of the industrial sector or process based on the information it obtains in interacting with industry and technical assistance organizations.

Key Objectives:

- Create streamlined access to easy to use, reliable and up-to-date environmentally-related information for specific industrial sectors/processes. Information will include environmentally-related technical options, technical process information, environmental risk information, and possibly even regulatory information. The goal is to enable manufacturers and technical assistance organizations to effectively understand and evaluate environmentally-related options and constraints.

Update:

A pilot National Resource Center for the metal finishing industry will be competed in the Fall of 1994. This pilot will be funded jointly by NIST and EPA and will steer the course for this effort in the MEP. If the pilot proves successful, it is hoped that additional National Resource Centers for additional sectors/processes will be initiated in following years.

Project Contact: N/A
MEP Contact: David Gold 301-975-5020
Funding Level: FY95 approximately $800K ($450K NIST/EPA, $350K estimated match)

Overall Coordination With EPA

Environmental Strategy Goal Number: 2.1
Timeframe : Ongoing

Background:

At the national level, efforts to assist smaller manufacturers need to work in concert to achieve their common goals. This is especially true with respect to environmental issues where several agencies play major roles. No agency has as direct a role as that of the Environmental Protection Agency (EPA). Coordination must be more than a simple hand shake between agencies. It must be a meaningful working relationship where projects and planning are coordinated and integrated.

Key Objectives:

- Coordinate efforts wherever possible and productive with the EPA.
- Explore the possibility of coordinated budget requests with EPA.

Update:

The NIST MEP currently has multiple joint projects and activities with various parts of EPA. These include:

Office of Research and Development

A $2.4M interagency agreement in FY94 will fund integration projects, tool development projects and part of a pilot national resource center. Also, a full time EPA employee from the Risk Reduction Laboratory has been assigned to the MEP as a visiting staff person at NIST for six to twelve months.

Design for Environment Project

A $600K interagency agreement in FY94 will fund part of the pilot national resource center, some industry profile and benchmarking development for the metal finishing industry, and two interactive satellite telecasts on Total Cost Accounting.

Office of Information Resources Management

A $190K interagency agreement in FY94 will fund a project which will allow greater fusion of environmental information residing in multiple databases.

Office of Solid Waste

A $450k interagency agreement in FY94 covering two years will expand the outreach activities of the NIST managed Recycling Technology Assistance Partnership.

Pollution Prevention Division

The MEP and the Pollution Prevention Division (PPD) will be releasing a joint brochure to the

NIST extension centers and PPD's state pollution prevention programs. The objective of this brochure is to increase awareness of the organizations about each other's existence. In addition, the MEP will be cosponsoring the National Pollution Prevention Roundtable's conference in November of 1994. A full day of this conference will be focused on technical assistance to smaller manufacturers and coordination between these organizations.

Project Contact: N/A
MEP Contact: David Gold, 301-975-5020
Funding Level: A total of over $3.5M in EPA funding for joint projects expected during FY95 using FY94 funds. MEP will be contributing at least an additional $1.25M to these joint projects.

Recycling Technology Assistance Partnership (ReTAP)

Environmental Strategy Goal Number: 1.1, 1.3, 1.4, 2.1, 3.1 and 3.4.
Timeframe : February 1994-February 1998

Background:

The Recycling Technology Assistance Partnership (ReTAP) seeks to transform the materials use practices of smaller manufacturers to attain greater efficiency through recycling as a critical step in the modernization of America's industrial base. By providing recycling technology extension services at the local level in Washington State and building a network of technology service providers and technology sources to disseminate technical information on recycling technology nationally, ReTAP will reduce the cost and risk of adopting recycling technologies to manufacturers. ReTAP is a joint project of the Clean Washington Center, Washington State's lead agency for market development of recyclable materials, and the National Recycling Coalition (NRC), a national association dedicated to advancing recycling. As a NIST MEP pilot project, ReTAP's four-year goal is to integrate recycling technology services into the services offered by NIST manufacturing extension center field engineers and to create a base of recycling information which these engineers and individual companies can easily access.

Key Objectives:

- Conducts technology validation projects with private companies which test technology developments for local application as solutions to specific problems as a means to extending the limits of recycled materials use in products and processes.
- Conducts in-plant process assessments to increase the use of recycled feedstocks and eliminating costly waste practices.
- Systematically scans information on recycling technologies relative to the needs identified in technology needs analyses.
- Compile information from above activities and make them easily accessible ultimately via electronically accessible database(s).
- Perform outreach and training events for technical assistance providers across the country to educate them about the benefits and methodologies for increasing use of recycled materials as well as about the information which ReTAP has available for their use.

Update:

The ReTap project has recently been initiated and has completed its start-up phase. Hiring of additional engineers has been completed and initiation of validation and assessment projects has begun. The Environmental Protection Agency's Office of Solid Waste is planning to enter into an inter-agency agreement with NIST for a total of $450K over two years to expand the outreach portion of the ReTAP project.

Project Contact: Vicki Sonntag, 206-464-6009

MEP Contact: Krista Johnsen 301-975-5020

Funding Level:FY94 $2.6M ($1.3M NIST/TRP, $1.3M match)
FY95 $2.8M ($1.1M NIST/TRP, $1.5M match)
FY96 $2.9M ($0.9M NIST/TRP, $2.0M match)
FY97 $2.2M ($0.7M NIST/TRP, $1.5M match)

Minutes of

Meeting Minutes

Hazardous Materials Management Skill Standard

Advisory Subcommittee on Certification

July 14 - 15, 1994
Roney Teaching Center, Waco, TX

The agenda for the meeting is attached.
A list of attendees is also attached.
Purpose of the Meeting:

Review current certification programs related to hazardous materials management that are maintained by professional societies. Investigate certification and licenser programs in other technology areas. Structure a framework that can be used for certification of Hazardous Materials Management Technicians that will be consistent with the Skills Standard being developed.

Meeting Activities:

Walt Edling, Vice President for Service Programs at CORD, gave an introduction to CORD and to the HazMat Skill Standard Project. He set the stage by explaining the importance of skill standards to the overall educational system and how they fit into a seamless curriculum leading from school to an occupation. Assessment and certification of the occupational skill plays a key role in this curriculum.

Jim Johnson give a review of the project activities to date and those activities planned for the remainder of the project. It was explained that Reggi Moore from NEHA will assist with the development of an industrial survey. He will begin by incorporating recommendations made during several focus group meetings into the current version of the task/activity outline. Particularly, recommendations made be advisory committee members during the June 17 Advisory Committee Meeting in Fort Worth will be integrated into the outline. A survey will be prepared from the results.

The representative of each professional society present gave an overview of the certification program they are affiliated with. This included the following:

Rick Richardson	NETA	Certified Environmental Trainer (CET)
Reggie Moore	NEHA	
Dan McGrew	HMCRI	
Jim Talley	NAEP	
Jean Drevdahl	ABIH/BESP	CSP

Certification and licensing associated with other technologies was investigated also. Jean Drevdahl explained the licensing requirements associated with nursing at different levels. Similarities and differences between state requirements was also discussed. Alan Sosbe gave an overview of the ASE certification for Automotive Technology. The ASE and NATEF have developed a process to certify training programs as well as individuals. This model appeared to have many similarities with the goals of the HazMat Skills Standard Certification efforts.

Valerie Sherwood explained the work that she was involved relative to assessment in the Skill Standards programs in Great Britain. Assessment is the key to a successful certification program. Several comments and questions were raised about "performance based" assessment. Although it was agreed that this was a desirable component of a certification program for technicians, care must be taken to assure that assessors are using common guidelines for the assessment procedures. A reasonable method for technician certification may be to have the performance bases assessment accomplished during a training program rather than as part of a comprehensive exam at the end of the training program.

The meeting reconvened on Friday morning with group discussions. Each group was to design a certification framework and to make recommendations for future activities in this area. The summation of the discussions showed the following:

a. pursues certification of training programs and of individuals completing those programs.

b. attempt to work within an existing structure, such as the Partnership for Environmental Technology Education (PETE) for the certification of training programs.

c. A comprehensive examination with a performance based component should be established for technicians. PETE as well as professional societies can provide this type of certification.

d. in addition to a comprehensive certification, individuals should have the opportunity to be certified for specific specialties. These may include asbestos, lead, nuclear, etc.

e. the Hazardous Materials Management Technology Skill Standard must be complete enough to serve as the basis for any certification program. It must also be accurate and include all aspects of the technology.

f. each committee member agreed to evaluate the outline of skills to verify that is complete and accurate before NEHA completes and mails the survey form.

g. the professions societies represented, agree to use their mailing lists to help distribute the survey to as wide of an audience as possible.

h. arrangements will be made by Rick Richardson to discuss these concepts with the PETE Board of Directors.

Hazardous Materials Management
Skill Standard Meeting
July 14-15, 1994

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VOLUME 1, NUMBER 1

SKILL STANDARDS REPORT

WHAT IS A SKILL STANDARD?

By Jim Johnson

Briefly stated, a skill standard is a list of skills, knowledge, and level of ability that a person must possess to be successful in a given occupation. There are as many ways of developing a skill standard as there are funded projects, but some common elements exist in all projects. A thorough definition of the occupation is essential. Typically included in the definition is a task list. This is not a simple list of activities but rather a description of the level of ability to which each task must be performed. For instance, if a photonics technician understands safety eyewear, does he/she simply use the eyewear provided for them or do they clean and store the eyewear, select those appropriate to the laser in use, test them for compliance, or design the eyewear for a given task?

An important component of the Clinton Administration's educational vision for the United States is the development of Occupational Skill Standards. As part of the initiative, **Goals 2000: Educate America**, twenty-two skill standards development projects have been funded. This is a joint effort of the Departments of Labor and Education. The Center for Occupational Research and Development (CORD) has received funding from the Department of Education for two of the projects—Photonics and Hazardous Materials Management Technology (HMMT).

The intent of *Skill Standards Report* is to communicate the progress of these and other skill standards projects and to share future plans and activities as the projects proceed.

After a comprehensive task list has been formulated, an analysis must be conducted to determine the skills and knowledge needed to successfully complete each task. Some skills may be very general in nature and applicable to a wide range of technologies, while others are very specific to a given occupation. Again, using the eyewear example, to understand the concept of optical density (OD) of protective filters, a photonics technician must know that an increase of 1 OD number (ie: from 3 to 4) increases the attenuation of the filter by a factor of 10 (from an optical attenuation of 1000 times to an attenuation of 10,000 times). A knowledge of exponents from mathematics is necessary to understand this concept. However, occupational skill standards would not attempt to define all the mathematical skills and knowledge involved with this concept.

MAKING THE TASK/SKILL LIST A "STANDARD"

Using the premise that standards are statements or policies that define a "norm" of expected outcomes, a skill standard must be recognized as the national norm for a particular occupation. Standards typically fall into two categories—regulatory or consensus. Regulatory standards are legislated into action and enforced by federal, state, or local authorities. Examples include the standards published by the EPA (Environmental Protection Agency) or OSHA (Occupational Safety and Health Administration). Skill standards are voluntary which means that they have become a standard by a consensus of opinion. The common ANSI (American National Standards Institute) standards are well-known examples of voluntary because they have been designed and agreed upon by committees of experts on the subject. Likewise, skill standards are voluntary standards designed by a coalition of experts. Both the Photonics project and the HMMT project have developed extensive coalitions of leaders from business, industry, government, professional societies, and education.

— story continued on next page

Inside:

Skill Standards Meet Tech Prep

Task Collection Theory

Photonics & HMMT Updates

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TASK COLLECTION THEORY: METHODOLOGIES AND LOGISTICS FOR THE PHOTONICS SKILL STANDARDS PROJECT

By Darrell Hull

Devising industry skill standards is a complex endeavor. The first and most important step toward standards development is taken when representatives from the designated industry are asked ***"What tasks must be accomplished by technicians in your field?"***

Because photonics and HMM are emerging technologies, the skill standards that will be developed through these projects must be as forward-looking as possible. The involvement of first line managers, engineers, or scientists that work directly with technicians is vital in this planning stage. Because these individuals are responsible for creating lasting improvements for photonics products or related services and are familiar with technician tasks and job requirements, they have a good sense of what the industry will face over the next five years.

Before industry representatives can respond to our question, we must first define the term "task." For the photonics skill standards project we will refer to tasks as assignments technicians must be able to accomplish on the job. Other skill standards projects may use a term such as objectives or competencies to describe what we call technician tasks. Regardless of the terminology, all skill standards projects will eventually link the needs of industry with the curriculum and training provided at educational institutions in order to provide technicians with the skills needed to be successful in their future jobs in industry.

To compile a comprehensive list of tasks, the industry representatives will be provided lists of tools and equipment along with action verbs that they will use to briefly state the tasks that technicians must perform. Industry committees, which will meet in June and July, will match action verbs with common tools or equipment. As task lists are gathered, the photonics project staff will organize the statements using Bloom's Taxonomy, a tool frequently used by educators, which will allow classification of tasks by the degree of cognitive processing required.

Once industry tasks have been defined for photonics technicians, committees of educators will be asked to translate those tasks into skills technicians must possess to be able to accomplish them. In a future issue of *Skill Standards Report*, we will focus on the translation of the tasks set forth by the photonics industry into skills developed by educators.

Category: Analysis, Test and Measurement

	Align	Select	Specify	Purchase	Fabricate	Mount	Install	Position	Rearrange	Repair	Refurbish	Integrate	Alter	Classify	Identify	Demonstrate	Operate	
Boxcar Averagers																		
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As Photonics task statements are gathered, they will be classified by degree of cognitive processing required to complete the task.

PhotonicsBEST Meeting

BUSINESS & EDUCATION STANDARDS FOR TECHNICIANS

July 23 in San Diego

- ***Photonics Engineers***
- ***Corporate Managers***
- ***Corporate Administrators***
- ***Photonics Technicians***

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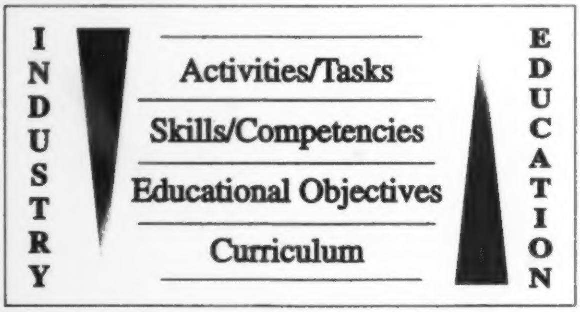
..."What is a Skill Standard?" continued

IMPACT OF SKILL STANDARDS ON INDUSTRY

Skill standards are intended to be industry led. Industry must define tasks and activities that employees are expected to perform. Educators participate in the process and help breakdown the tasks into skills and then take the lead in developing the educational objectives and training activities to instill these skills. The process and involvement of industry and education is illustrated below.



IMPACT OF SKILL STANDARDS ON EDUCATION

The current skill standards development program will define twenty-two different occupations from a national perspective. These standards can be used by schools as guidelines for implementing new training programs or evaluating existing programs. The standards will accelerate the design of new programs and curriculum, but schools must mold the national skill standards to the needs of local industry by forming local coalitions of experts. This has a secondary benefit because it will allow for improved communication between schools and local industry.

Uniform job descriptions benefit both industry and education by providing a clearly recognizable educational target. This is a double-edged sword because educational providers will be judged and held accountable to the standard.

SKILL STANDARDS MEET TECH PREP

NATIONAL TECH PREP NETWORK TO SHOWCASE PROJECTS AT SPRING CONFERENCE

By Julie Vitale

The most logical marriage of initiatives between education and industry is that of the Tech Prep/Associate Degree movement and the Industry Skill Standards projects. Both are federally-funded projects (Tech Prep funded through the Department of Education and Skill Standards funded through both the Departments of Education and Labor) with the purpose of better preparing students to enter the workforce.

Tech Prep/Associate Degree is a philosophy and a process of designing curriculum to connect secondary and postsecondary education levels as well as to integrate the academic and vocational skills and knowledge necessary to prepare for a career field. With this in mind, the skill standards projects add a much needed and critical component of a Tech Prep curriculum; the outcomes that a Tech Prep student must have upon exiting education and entering the workforce. Tech Prep educators are seeking advice, input, and involvement from businesses around the country and in various occupations to help them devise a logical sequence of courses that fully develop the skills industry requires now as well as in the future. Tech Prep graduates will be a new kind of employee; one that can continuously build their skills upon a foundation of solid math and science concepts.

The first step toward collaboration will be taken on April 10, at the National Tech Prep Network (NTPN) Conference in Baltimore. Project directors of various skill standards projects will conduct a pre-conference session to present the total scope and outcomes of their projects to Tech Prep educators. This gathering of education and industry representatives will initiate a dialogue between those who have a vested interest in skill standards and educational reform.

For more information on the NTPN Pre-Conference session, contact Jim Johnson at CORD, 800-972-2766.

Skill Standards Seminar
October 3 - 4, 1994
Roney Teaching Center
Waco, Texas

✓ ***AGENDA: Assisting Schools in Program Evaluation***

✓ ***PARTICIPANTS: Representatives from Industry and Education***

TASK COLLECTION THEORY: METHODOLOGIES AND LOGISTICS FOR THE PHOTONICS SKILL STANDARDS PROJECT

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Jim Johnson

REPORT FROM THE DIRECTOR

PROJECT: HMMT

The HMMT project has established an advisory committee which met for the first time on December 3, 1993 and consists of 40 representatives from industry, labor, societies, education, and government agencies. Four groupings or specialities within HMMT were identified: Compliance, Remediation, Laboratory/Analytical, and STD (storage, transportation, and disposal). They are all expected to have a similar foundation of HMMT skills but possess enhanced skills in the speciality area.

Regional "focus" group meetings are being conducted to help identify local variations in HMMT requirements. The first one of its kind was held on February 23 at South Seattle Community College, and another was held in Miami on March 8. Additional meetings are being planned for Albuquerque, New Orleans, and Atlanta. The second advisory committee meeting is being planned for Fort Worth in June to coordinate with the annual meeting of the National Environmental Health Association. A survey is being prepared for distribution to several hundred potential employers of HMM technicians, with the results expected to be compiled and validated by the Advisory Committee later in the summer and eventually disseminated at the Skill Standards seminar in October.

Darrell Hull

REPORT FROM THE DIRECTOR

PROJECT: PHOTONICS

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VOLUME 1, NUMBER 1

SKILL STANDARDS REPORT

WHAT IS A SKILL STANDARD?

By Jim Johnson

Briefly stated, a skill standard is a list of skills, knowledge, and level of ability that a person must possess to be successful in a given occupation. There are as many ways of developing a skill standard as there are funded projects, but some common elements exist in all projects. A thorough definition of the occupation is essential. Typically included in the definition is a task list. This is not a simple list of activities but rather a description of the level of ability to which each task must be performed. For instance, if a photonics technician understands safety eyewear, does he/she simply use the eyewear provided for them or do they clean and store the eyewear, select those appropriate to the laser in use, test them for compliance, or design the eyewear for a given task?

An important component of the Clinton Administration's educational vision for the United States is the development of Occupational Skill Standards. As part of the initiative, **Goals 2000: Educate America**, twenty-two skill standards development projects have been funded. This is a joint effort of the Departments of Labor and Education. The Center for Occupational Research and Development (CORD) has received funding from the Department of Education for two of the projects—Photonics and Hazardous Materials Management Technology (HMMT).

The intent of *Skill Standards Report* is to communicate the progress of these and other skill standards projects and to share future plans and activities as the projects proceed.

After a comprehensive task list has been formulated, an analysis must be conducted to determine the skills and knowledge needed to successfully complete each task. Some skills may be very general in nature and applicable to a wide range of technologies, while others are very specific to a given occupation. Again, using the eyewear example, to understand the concept of optical density (OD) of protective filters, a photonics technician must know that an increase of 1 OD number (ie: from 3 to 4) increases the attenuation of the filter by a factor of 10 (from an optical attenuation of 1000 times to an attenuation of 10,000 times). A knowledge of exponents from mathematics is necessary to understand this concept. However, occupational skill standards would not attempt to define all the mathematical skills and knowledge involved with this concept.

MAKING THE TASK/SKILL LIST A "STANDARD"

Using the premise that standards are statements or policies that define a "norm" of expected outcomes, a skill standard must be recognized as the national norm for a particular occupation. Standards typically fall into two categories—regulatory or consensus. Regulatory standards are legislated into action and enforced by federal, state, or local authorities. Examples include the standards published by the EPA (Environmental Protection Agency) or OSHA (Occupational Safety and Health Administration). Skill standards are voluntary which means that they have become a standard by a consensus of opinion. The common ANSI (American National Standards Institute) standards are well-known examples of voluntary because they have been designed and agreed upon by committees of experts on the subject. Likewise, skill standards are voluntary standards designed by a coalition of experts. Both the Photonics project and the HMMT project have developed extensive coalitions of leaders from business, industry, government, professional societies, and education.

— story continued on next page

Inside:

Skill Standards Meet Tech Prep

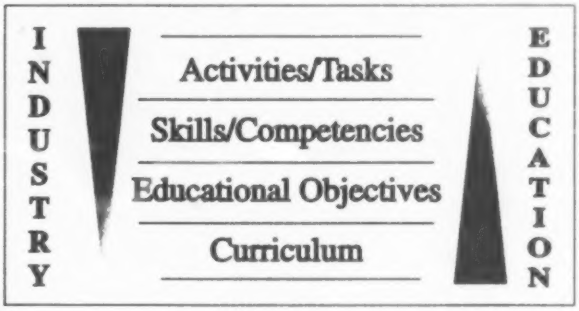
Task Collection Theory

Photonics & HMMT Updates

..."What is a Skill Standard?" continued

IMPACT OF SKILL STANDARDS ON INDUSTRY

Skill standards are intended to be industry led. Industry must define tasks and activities that employees are expected to perform. Educators participate in the process and help breakdown the tasks into skills and then take the lead in developing the educational objectives and training activities to instill these skills. The process and involvement of industry and education is illustrated below.



IMPACT OF SKILL STANDARDS ON EDUCATION

The current skill standards development program will define twenty-two different occupations from a national perspective. These standards can be used by schools as guidelines for implementing new training programs or evaluating existing programs. The standards will accelerate the design of new programs and curriculum, but schools must mold the national skill standards to the needs of local industry by forming local coalitions of experts. This has a secondary benefit because it will allow for improved communication between schools and local industry.

Uniform job descriptions benefit both industry and education by providing a clearly recognizable educational target. This is a double-edged sword because educational providers will be judged and held accountable to the standard.

SKILL STANDARDS MEET TECH PREP

NATIONAL TECH PREP NETWORK TO SHOWCASE PROJECTS AT SPRING CONFERENCE

By Julie Vitale

The most logical marriage of initiatives between education and industry is that of the Tech Prep/Associate Degree movement and the Industry Skill Standards projects. Both are federally-funded projects (Tech Prep funded through the Department of Education and Skill Standards funded through both the Departments of Education and Labor) with the purpose of better preparing students to enter the workforce.

Tech Prep/Associate Degree is a philosophy and a process of designing curriculum to connect secondary and postsecondary education levels as well as to integrate the academic and vocational skills and knowledge necessary to prepare for a career field. With this in mind, the skill standards projects add a much needed and critical component of a Tech Prep curriculum; the outcomes that a Tech Prep student must have upon exiting education and entering the workforce. Tech Prep educators are seeking advice, input, and involvement from businesses around the country and in various occupations to help them devise a logical sequence of courses that fully develop the skills industry requires now as well as in the future. Tech Prep graduates will be a new kind of employee; one that can continuously build their skills upon a foundation of solid math and science concepts.

The first step toward collaboration will be taken on April 10, at the National Tech Prep Network (NTPN) Conference in Baltimore. Project directors of various skill standards projects will conduct a pre-conference session to present the total scope and outcomes of their projects to Tech Prep educators. This gathering of education and industry representatives will initiate a dialogue between those who have a vested interest in skill standards and educational reform.

For more information on the NTPN Pre-Conference session, contact Jim Johnson at CORD, 800-972-2766.

Skill Standards Seminar
October 3 - 4, 1994
Roney Teaching Center
Waco, Texas

- ✓ ***AGENDA: Assisting Schools in Program Evaluation***
- ✓ ***PARTICIPANTS: Representatives from Industry and Education***

TASK COLLECTION THEORY: METHODOLOGIES AND LOGISTICS FOR THE PHOTONICS SKILL STANDARDS PROJECT

By Darrell Hull

Devising industry skill standards is a complex endeavor. The first and most important step toward standards development is taken when representatives from the designated industry are asked ***"What tasks must be accomplished by technicians in your field?"***

Because photonics and HMM are emerging technologies, the skill standards that will be developed through these projects must be as forward-looking as possible. The involvement of first line managers, engineers, or scientists that work directly with technicians is vital in this planning stage. Because these individuals are responsible for creating lasting improvements for photonics products or related services and are familiar with technician tasks and job requirements, they have a good sense of what the industry will face over the next five years.

Before industry representatives can respond to our question, we must first define the term "task." For the photonics skill standards project we will refer to tasks as assignments technicians must be able to accomplish on the job. Other skill standards projects may use a term such as objectives or competencies to describe what we call technician tasks. Regardless of the terminology, all skill standards projects will eventually link the needs of industry with the curriculum and training provided at educational institutions in order to provide technicians with the skills needed to be successful in their future jobs in industry.

To compile a comprehensive list of tasks, the industry representatives will be provided lists of tools and equipment along with action verbs that they will use to briefly state the tasks that technicians must perform. Industry committees, which will meet in June and July, will match action verbs with common tools or equipment. As task lists are gathered, the photonics project staff will organize the statements using Bloom's Taxonomy, a tool frequently used by educators, which will allow classification of tasks by the degree of cognitive processing required.

Once industry tasks have been defined for photonics technicians, committees of educators will be asked to translate those tasks into skills technicians must possess to be able to accomplish them. In a future issue of *Skill Standards Report*, we will focus on the translation of the tasks set forth by the photonics industry into skills developed by educators.

Category: Analysis, Test and Measurement

	Align	Select	Specify	Purchase	Fabricate	Mount	Install	Position	Rearrange	Repair	Refurbish	Integrate	Alter	Classify	Identify	Demonstrate	Operate	
Boxcar Averagers																		
Densitometers																		
Interferometers																		
Microdensitometers																		
Microscopes																		
Monochrometers																		
Optics Metrology Equipment																		
Power/Energy Meters																		
Radiometers/Photometers																		
Reflectometers																		
Spectroradiometers																		
Spectrum Analyzers																		
Time-Delay Generators																		

As Photonics task statements are gathered, they will be classified by degree of cognitive processing required to complete the task.

PhotonicsBEST Meeting

BUSINESS & EDUCATION STANDARDS FOR TECHNICIANS

July 23 in San Diego

- **Photonics Engineers**
- **Corporate Managers**
- **Corporate Administrators**
- **Photonics Technicians**

Visit our booth at CLEO in Anaheim

Jim Johnson

REPORT FROM THE DIRECTOR

PROJECT: HMMT

The HMMT project has established an advisory committee which met for the first time on December 3, 1993 and consists of 40 representatives from industry, labor, societies, education, and government agencies. Four groupings or specialities within HMMT were identified: Compliance, Remediation, Laboratory/Analytical, and STD (storage, transportation, and disposal). They are all expected to have a similar foundation of HMMT skills but possess enhanced skills in the speciality area.

Regional "focus" group meetings are being conducted to help identify local variations in HMMT requirements. The first one of its kind was held on February 23 at South Seattle Community College, and another was held in Miami on March 8. Additional meetings are being planned for Albuquerque, New Orleans, and Atlanta. The second advisory committee meeting is being planned for Fort Worth in June to coordinate with the annual meeting of the National Environmental Health Association. A survey is being prepared for distribution to several hundred potential employers of HMM technicians, with the results expected to be compiled and validated by the Advisory Committee later in the summer and eventually disseminated at the Skill Standards seminar in October.

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VOLUME 1, NUMBER 2

SKILL STANDARDS REPORT

THE NEED FOR SKILL STANDARDS

By Darrell Hull

In the earlier part of this century, the industrial system in the United States was second to none. Our industries flourished because of our economic strength, a proven approach to mass manufacturing, superior factories and equipment, and a workforce composed of strong managers and capable, compliant front-line workers. A college degree was considered a sure road to economic and professional success and the guarantee of a superior lifestyle that would improve each year. This concept became part of the American dream, and its perception has persisted into the present, even as the reality of the American job market has shifted.

What are the keys to competitiveness in America for corporations that wish to compete on a global scale? Certainly their workforce plays a primary role. New workers in this country must be as capable and competent as their counterparts in other countries, or the U.S. will lose the heightening economic battle.

The intent of the *Skill Standards Report* is to communicate the progress of the Photonics and HMMT skill standards projects and to share future plans and activities as the projects proceed.

Until the 1980s, our unskilled and semiskilled workers were competing indirectly with workers in third-world countries who could learn their jobs relatively quickly, achieve a comparable or superior level of quality, and remain satisfied with wages that were five to ten times lower than those of the American worker. The only way for American companies to compete globally and maintain operations within the United States was to make full use of information systems, sophisticated technology, and automation. Fewer but higher-skilled workers were needed as a result. Delays in retooling and restaffing or "upskilling" resulted in loss of market share and loss of jobs. Something had to be done. The competence of students applying for jobs had to be addressed.

Nearly two-thirds of all students in public education do not complete a baccalaureate degree and are often perceived as students who cannot learn foundational subjects such as math and science. In fact, it is these students who in the future must be able to apply and transfer the same academic foundations even as the technology changes around them.

Community and technical college associate degree programs can play a role in preparing this large majority of students for the technical and academic skills they need in the workforce. Educational standards in an ideal school would include achievement that is measured by demonstrable skills and abilities. Employers not only would have a voice in setting the outcomes, but also would provide a kind of quality check on the educational process by their interest in hiring recent graduates of such a school.

In an effort to obtain consensus on the skills that should be imparted in educational institutions for these workers, the U.S. Departments of Education and Labor have funded 22 projects to identify and develop skill standards. A complete listing of the skills that should be taught would break down barriers such as different course names or numbers, and require schools to use a common language to describe what is taught. Translated, skill standards would provide a consistent base of skills which employers could use to evaluate potential employees.

Obviously, several iterations of employers and educators reviewing each other's work are required before the standard becomes a consensus document that students/workers, educators, employers, government, organized labor and others can rely upon to successfully link industry needs and education goals. This endeavor is what the 22 individual skill standards projects hope to accomplish.

Inside:

Constructing a Common Framework...

Certification Programs and Skill Standards

CONSTRUCTING A COMMON FRAMEWORK FOR SKILL STANDARDS PROJECTS

Before the National Skill Standards Board can function effectively, a set of criteria for endorsing standards must be developed. To build this common "framework," the Institute for Educational Leadership (IEL) has designed a process from which all project grantees should construct a skill standards model. Six commonly used models that meet the minimum necessary criteria for developing skill standards have been developed. These show that the skill standards:

- *must* communicate information to various audiences
- *must* allow for comparison of standards across occupational clusters
- *must* provide an avenue for implementation of certification activities such as assessment, recertification, and career mobility

Based on these criteria, any of the following six models as well as the Center for Occupational Research and Development (CORD) model for the Photonics Skill Standards Project could be acceptable standard forms for a skill standard. The first six models use APDOT categorization, and their advantages and disadvantages were developed by IEL. The final example demonstrates the model CORD has used in constructing the Photonics Skill Standards Project.

DEVELOPING AND EVALUATING MODELS FOR UNIFORMITY

MODEL A DESCRIPTION

The standard set is expressed as one or more statements of skill standards. Supporting evidence describing the requisite knowledge/skills and assessment is specified by standards set, but is not part of the standard.

Advantages

Standards statements can be written in any format and at any level of specificity. Each standard set is supported by descriptions of the requisite knowledge, skills, and assessments. Certification by standard set is possible.

Disadvantages

Descriptions may contain some duplicate information, since the same knowledge and skills could be required in more than one standard set. Having the same knowledge and skills apply to different standards sets may affect how assessments are constructed. Comparison of standards across and within occupational clusters may be limited if standards sets and supporting evidence are written at different levels of specificity.

MODEL A: SKILL STANDARDS SET + SUPPORTING EVIDENCE

Standards Set:

The worker calibrates equipment to produce a product within +/- .0001 degrees of specifications. Calibrations occur without assistance within two hours of blueprint review.

Supporting Evidence: *Knowledge/Skills*

- Can apply arithmetic calculations with 100% accuracy
- Has knowledge of basic manufacturing terminology
- Has knowledge of computer programming techniques for equipment calibration
- Has knowledge of algorithms to perform calculations
- Is able to develop a diagnostic computer program to obtain optimum equipment operations
- Is able to calculate equipment without assistance to produce within +/- .0001 degrees of blueprint specifications

Assessment:

- Assessments: a test of knowledge, a performance exercise, and a portfolio of 10 successful computerized manufacturing programs
- Assessments are given only by approved NWM programs.

MODEL B DESCRIPTION

The standard is a competency unit that includes the duty/function, tasks/activities, and performance criteria. The range specifies the circumstances under which performance criteria are applied.

Advantages

The competency unit, which as a whole represents the standard, is written in a specific grammatical format and at a predetermined level of specificity. This uniformity can enhance interpretation by different users. Certifications could be given by competency unit to permit horizontal as well as vertical career growth. Knowledge and skills must be integrated within the context of the work to be performed.

Disadvantages

A restricted format for writing standards limits the flexibility of the author. The parameters for assessment are established by the evidence of successful performance and the range indicators. This may restrict the way assessments are conducted. Using all performance criteria rather than sampling would be time-consuming if large numbers of individuals had to be assessed.

MODEL B: COMPETENCY UNITS

Duty/Function:

Calibration of manufacturing equipment to specifications

Tasks/Activities:

- Performs calculations to translate scaled drawings
- Interprets manufacturing specifications to determine requisite equipment calibrations
- Designs diagnostic programs to calibrate equipment

Evidence of Successful Performance:

- Applies appropriate mathematical calculations with 100% accuracy in translating scaled specifications to size
- Calibrates equipment that produces a product within +/- .0001 degrees of blueprint specifications
- Calibrates equipment within prescribed time frame

Range:

- Standard manufacturing specifications for metal products or electromagnetic wire
- XYZ computerized manufacturing system
- Manufacturing or recycling settings

MODEL C DESCRIPTION

Standards are expressed in terms of content and performance. To distinguish degrees of skill mastery, different performance standards can be established for the same content standard.

Advantages

Standards clearly differentiate what one needs to know or be able to do and the level at which competency is determined. Performance standards are clearly distinguishable from content standards. Performance standards can be used to differentiate vertical as well as horizontal career growth requirements. Content standards can be further clustered/organized by worker attributes (APDOT Content Model). A standard format for writing standards facilitates comparisons across and within occupational clusters.

Disadvantages

Every content standard must have one or more performance standard. Performance standards cannot relate to more than one content standard. Assessment strategies must be well conceived to avoid creating performance standards that are not practicable.

MODEL C: CONTENT- & PERFORMANCE-BASED STANDARDS

Content Standards:

Workplace Basic Skills: the worker knows basic mathematical calculations to compute density.

Occupational Knowledge: the worker knows manufacturing terms frequently used in product blueprint specifications.

Occupational Skills: the worker writes manufacturing programs using commonly accepted computer language.

Performance Standards:

Written Tests:

- The worker attains a passing score on the NWM written tests of basic skills.

Performance Exercises:

- The worker produces a widget within +/- .0001 degrees of specifications within two hours of review (entry level).
- The worker's portfolio demonstrates creation of operable computer programs written in 10 or more manufacturing setups (advanced level).

MODEL D DESCRIPTION

The standards module contains four components: technical skills, equipment/tools, basic skills, and range indicators.

Advantages

Certification of standards can be done by each component of a module (e.g., tools and equipment) or by module. Standards modules can differ by setting. Each component of the standards module can be written in any format.

Disadvantages

The module does not describe how the knowledge, skills, and equipment/tools are to be employed. Performance criteria are not stated. With no standard format for writing standards, comparisons across and within occupational clusters may be limited. Equipment and tools may become outdated more quickly than the technical and foundational skills.

MODEL D: SKILLS + TOOLS MODULE

Technical Skills:

- Has knowledge of basic manufacturing terminology
- Has knowledge of advanced programming techniques
- Is able to calibrate equipment to optimum standards
- Is able to calibrate equipment without assistance to produce the product within +/- .0001 degrees of specifications
- Is able to write manufacturing computer programs

Equipment and Tools:

- XYZ computerized manufacturing system
- Standard computer equipment

Foundation Skills:

- Has knowledge of algorithms to perform calculations for density
- Can apply arithmetic calculations with 100% accuracy
- Is able to read blueprint specifications
- Knows basic computer operations

Range:

- Manufacturing or recycling settings which specialize in metal or electromagnetic wire products
- XYZ computerized manufacturing system

MODEL E DESCRIPTION

This model contains both basic workplace skill standards and cross-functional skills. Each skill statement is a standard.

Advantages

Only basic skills and cross-functional skills are specified. Both content and performance standards can be established but are not required by the model. Standards for occupational clusters rather than single occupations can be established. Certification of competency can be based upon a set of basic workplace and cross-functional skills that are not occupationally specific. The certification entity would not need to be linked to a particular industry or occupation.

Disadvantages

Skill standards would not include occupationally specific standards. If standards are established across occupational clusters, validation to a specific occupation would still be necessary. Without a common format for expressing standards, comparisons across occupational clusters may be limited.

MODEL E: WORKPLACE BASICS & CROSS-FUNCTIONAL SKILLS

Workplace Basic Skills:

Content Standards:

- Has knowledge of arithmetic to perform calculations for density

Performance Standards:
- Can apply calculations with 100% accuracy

Cross-Functional Skills:

Content Standards:
- Able to read manufacturing blueprint specifications without assistance
- Knows computer programming

Performance Standards:
- Demonstrates 100% accuracy in interpreting five different blueprint specifications
- Creates 10 or more operable computer programs

MODEL F DESCRIPTION

Only occupationally specific standards are described. Each standard consists of a description of the knowledge, skills, duties/functions, and range.

Advantages

Only occupationally specific information (knowledge and skills as well as duties/functions) is provided in each standard. Standards are clearly linked to work duties/functions. Certification of occupational-specific standards can be performed separately from basic workplace skills or cross-functional skills. Certification by duty/function is also possible.

Disadvantages

Without a common format for expressing standards, comparisons across occupational clusters or with foundational skills may be difficult. Standards will not provide information about foundational skills such as basic and cross-functional skills. Occupational knowledge and skills required for one duty/function may also be required for others. This may cause duplicate information to be recorded in each standard. Performance criteria are not specified.

MODEL F: OCCUPATIONAL-SPECIFIC STANDARDS

Occupational Knowledge:
- Has knowledge of basic manufacturing terminology
- Has knowledge of advanced programming techniques for equipment calibration
- Has knowledge of computer programs commonly used in manufacturing

Occupational Skills:
- Is able to calibrate equipment to optimum standards
- Is able to calculate equipment with 100% accuracy
- Is able to write manufacturing computer programs
- Is able to develop diagnostic computer programs for equipment calibrations

Duties/Functions:
- Develops computerized diagnostic programs to calibrate optimum equipment efficiency
- Calibrates equipment to optimum operating standards
- Develops five-stage computerized manufacturing programs to meet customer blueprint specifications
- Knows basic computer operations

Range:
- Standard manufacturing specifications for metal products and electromagnetic wire
- XYZ computerized manufacturing system
- Manufacturing or recycling settings

CORD PHOTONICS MODEL DESCRIPTION

Standards are a collection of "tasks" and their associated "skills/competencies or knowledge components." Tasks are simple two-word statements, developed initially by a content expert. This is done by first listing the tools and equipment used by workers in the field and allowing members of the industry to connect these tools/equipment with verbs that indicate how the instrument is used. The tasks are validated and translated (again by educational content experts) into skills/competencies or knowledge components.

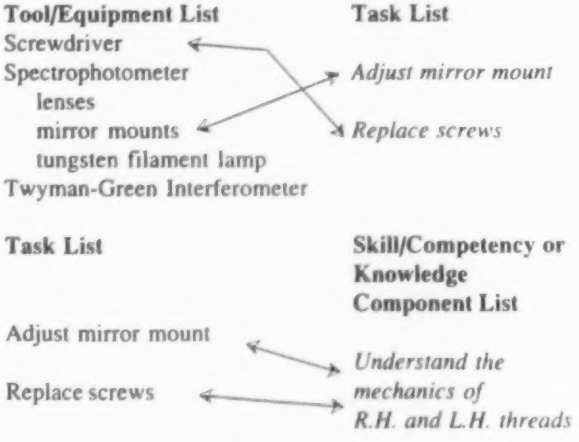
Advantages

Industry can easily provide a great deal of input into the standards. Industry and educators have clearly established roles, making it easier for them to participate in development. This understanding helps the project attract large numbers of coalition members from both sectors. Certification is tied to performance of the industry-specified tasks if necessary, creating an opportunity for applied, hands-on evaluation of competency. Simplicity and concrete terms should provide users with a workable standard, capable of being understood by educators, students, and employers, so that adoption is not a complex process. Curriculum development that is applied in nature is a straightforward endeavor using this output.

Disadvantages

Collection of the task data reveals many useless variables that would not be considered "real" tasks, but are evaluated regardless (i.e. clean software). This process would require adaptation for occupational categories that are nontechnical in nature.

MODEL



These models demonstrate only a few popular ideas for constructing standards. Many new formats continue to be proposed to industry and education. The design chosen for the NSSB must meet as many of the current industry needs as possible, yet remain flexible enough to change as new and better ways of presenting standards develop.

CERTIFICATION PROGRAMS AND SKILL STANDARDS

By Jim Johnson

A critical part of the 22 skill standards projects currently being developed is the identification of certification verifying that an individual has mastered the skills listed in the standard. The term "certification" may have different meanings depending on the technology or profession involved.

Often, "certification" is associated with management or professional levels of employment. The few certification programs that do exist for the technician are called "non-professional" or "sub-professional" certifications. Generally, they have little influence on employers. Virtually all certification programs require a candidate to have an educational degree, some related occupational experience, and a passing score on a competency test. Many certification programs also have a "code of ethics" that the certified individual accepts. The more rigorous the requirements, the more prestigious and respected the certification. These requirements do give an indication of an individual's qualification and work ethics, but they do not verify the mastery of any particular skill. Certification programs of this type need to be tied to the National Skill Standards so that the testing and assessment methods do, in fact, verify that the individual is proficient to the level of ability defined by the skill standard.

> ***Certification programs need to be tied to the National Skill Standards so that the testing and assessment methods verify that the individual is proficient to the level of ability defined by the skill standard.***

Most schools find it essential to be "accredited." Recognized accrediting agencies such as the Southern Association of Schools and Colleges (SASC) and the Accreditation Board for Engineering and Technology (ABET) have been setting standards for school operations and programs for many years. Recently, occupational groups and professional societies have been getting involved by setting guidelines that they expect training programs to follow. Automotive Service Excellence (ASE) and the National Automotive Technical Education Foundation (NATEF) have established a successful certification process for the automobile service industry. These guidelines outline the industry's expectations of training programs and address such issues as number of hours of training required, topics covered, tools and equipment used in the training, and instructor qualifications. The guidelines also define expected student performance. The certification program sets guidelines for the assessment of both the training facility and the students. The success of the program is primarily due to the fact that the employers are stakeholders in the educational process and recognize the practical value of the certification process.

To complicate things more, many states require licenses for certain technologies, such as health occupations. Other federal and state agencies also require certificates of training. In the field of Hazardous Materials Management, for example, the Occupational Safety and Health Administration (OSHA) requires special training for employees before they are "certified" to work with hazardous materials. Construction workers may need certifications from the state to work with lead and asbestos abatement.

Certification and the accompanying assessment of skills are a major part of the 22 National Skill Standards Projects and will be one of the top priorities of the newly established National Skill Standards Board. Certification provides another method for industry and professional leaders to be actively involved in the educational process.

WORKSITE LEARNING SPECIALTY CONFERENCE

following the National Tech Prep Network Annual Conference

October 30-31, Minneapolis

Co-sponsors:

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CORD

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Jim Johnson

REPORT FROM THE DIRECTOR

PROJECT: HMMT

Approximately 50 Hazardous Materials Management technicians (HMMT) contributed to an activity journal earlier this year by listing the job duties and responsibilities they encounter on a daily basis. These duties, along with information from various job descriptions, were grouped and organized into a Task Outline. This was presented to representatives of industry and education at three regional focus group meetings. The outline was also presented to the National HazMat Advisory Committee at a June meeting in Fort Worth, Texas. The comments and suggestions from attendees of these meetings are now being incorporated into the outline.

Staff at the National Environmental Health Association (NEHA) are using the outline to design an industrial survey. The survey will be sent to a large number of HMMTs and their employers. The results will validate the tasks and prioritize each task based on its importance and how often it is performed on the job.

A certification subcommittee has been formed and had its first meeting in July at the Roney Teaching Center in Waco, Texas, with the group investigating various certification programs and discussing possible methods of incorporating the skill standards into technician certification programs.

Darrell Hull

REPORT FROM THE DIRECTOR

PROJECT: PHOTONICS

Over 100 coalition members from the photonics industry completed task collection documents and discussed the development process for the project this past May in Anaheim, California. A second meeting, PhotonicsBEST, held this month in San Diego, was industry's final contribution to the initial phase of the project, giving coalition members from several professional organizations within the industry an opportunity to evaluate a compilation of all tasks provided to date.

Once the tasks for technicians have been analyzed, a meeting will be held in late August specifically for educators, who will begin the translation of tasks into skills. For example, industry will tell us the tasks workers should be able to perform in the workplace, such as "Align a Nd:YAG laser." The educators will then translate this task statement into skills that should be imparted in the educational institution. These might include the principle of reflection and the mechanics of mirror mounts, Q-switch operation, and so on. Educators will also be asked to develop a consensus opinion on the qualifications needed by educators to teach in this area. If you are interested in participating in the project or would like more information, you may contact me at CORD, 800-972-2766, or by E-mail (darrellhull@delphi.com).

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